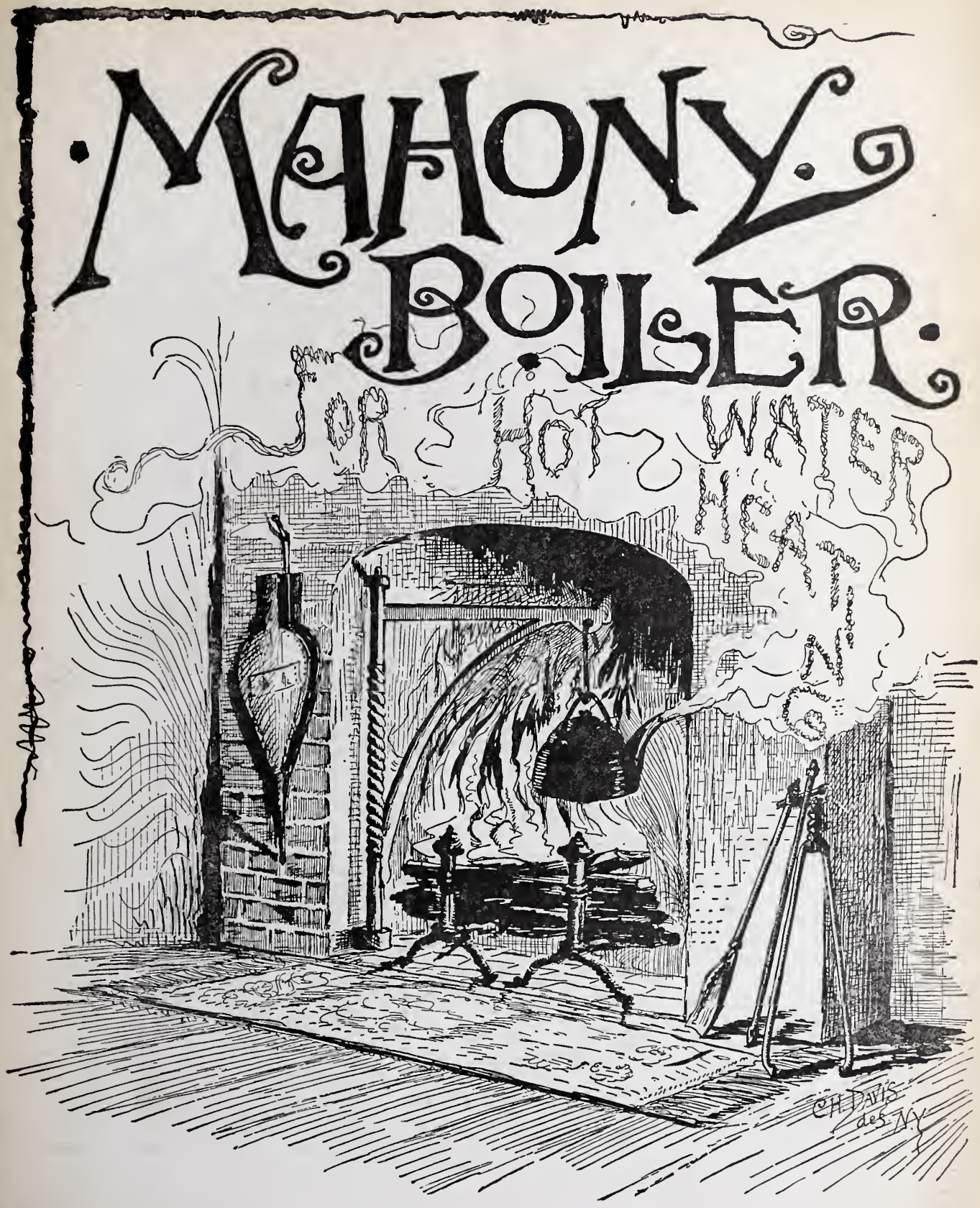

MAHONY
BOILER
FOR HOT WATER HEAT
CH. DAVIS des. N.Y.

FIGURE 1.

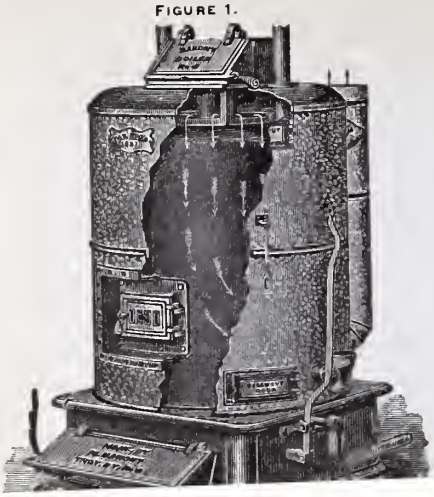
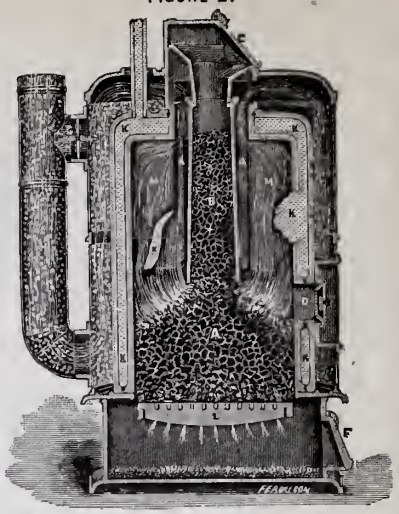


FIGURE 2.



SELF-FEEDING RETURN FLUE HEATER.

THE LIBRARIES

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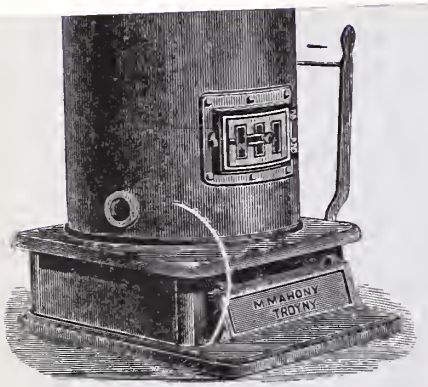
FIGURE 3.

FACE-BURNING RETURN FLUE HEATER.



SELF-FEEDING HEATER WITHOUT JACKET

THESE CUTS FOR ADVERTISING FREE TO CUSTOMERS ON APPLICATION.

FIGURE 5

SELF-FEEDING HEATER WITHOUT JACKET.

CATALOGUE

OF THE

MAHONY HOT WATER HEATER

FOR HEATING

Residences, Churches, Schools, Greenhouses, Etc.

BY

HOT WATER.

Hot Water System Illustrated by Practical Plans.

M. MAHONY,

TROY, N. Y.

H. Stowell's Printing House.
Cannon Place, Troy, N. Y.

PREFACE.

Heating by hot water is attracting so much attention from architects, dealers in heating apparatus, and the public generally, that we find it necessary to issue this Catalogue in response to the inquiries for information received relating to the practical introduction and use of the system, and while we do not forget the Mahony Heaters, we endeavor to present the subject in a manner to be understood by every one.

In 1715 Sir Martin Triewald first utilized hot water for heating purposes by warming his greenhouses at Newcastle-upon-Tyne. Since then the system has been in extensive use in England and Canada, but it is only within a few years that popular attention has been attracted to the system in the United States, where it is now rapidly growing into favor.

Attention is called to the apparatus shown in this Catalogue as being especially adapted to the warming of residences, greenhouses, etc., because of its neat appearance, convenience, durability and moderate cost.

The fact that we have for years manufactured all kinds of heating apparatus, including in our line Steam Boilers, Hot Water Heaters, Combination Air and Water Heaters, Combination Air and Steam Heaters and a full line of Warm Air Furnaces, renders our statements of the comparative merits of the various systems worthy of consideration, since we are equally interested in the sale of all the heaters.

Correspondence is invited from all who are interested in the purchase of improved heating and ventilating apparatus.

Respectfully,

M. MAHONY.

Troy, N. Y., 1888.

THE HOT WATER SYSTEM.

A complete hot water "plant" ready for use in residences, etc., consists of the HEATER or Boiler; the RADIATORS, placed in the rooms to be warmed; the PIPES for conducting the heated water from the heater to the radiators and thence back again; the TANK for the expansion of the water due to heating; a water-glass on the tank to show the level of the water; the VALVES for the control of the circulation, the filling and emptying of the system, etc.; the AIR COCKS for expelling the air from the pipes and radiators, and an OVER-FLOW PIPE from the expansion tank, either open to the atmosphere or closed with a safety-valve.

It will thus be seen that the apparatus used is very similar to that required for heating by steam in appearance and cost, the principal difference between the systems being that in the one the boiler alone contains water, while in the other the entire apparatus except the expansion tank is filled.

Hot water is a better medium for distributing heat than steam, because of greater uniformity in the temperature obtained; steadiness of action; simpler apparatus, more perfect control of the heat to suit the weather, and absolute safety. The cost of introducing hot water is slightly in excess of that of steam, because of the greater amount of surface and the better work required, but the cost of operating and maintaining the system is much less, particularly in mild weather, when a low fire, that would not begin to make steam, is found ample to heat the house with hot water. In mild weather it is difficult to get *any* heat from steam without having *too much*, while the temperature of the water can be regulated to any degree to suit the weather.

It hardly seems necessary to compare the hot water system with warm air heating, because the difference in the cost of the necessary apparatus prevents their becoming rivals. We cannot admit the usual arguments of those who make only steam or hot-water apparatus, that furnaces cannot do satisfactory work because of "gas," "dust," "burnt air," etc., because there is not the slightest need of such results if the furnaces are fairly treated. The truth is that in medium-sized residences, excellent work can be done with the warm air furnaces.

The system of using hot water and warm air in combination has many good points, and frequently gives an intelligent dealer an advantage over his competitors in making estimates. In large residences or buildings where warm air furnaces have proven unsatisfactory, the combination system is especially valuable.

Classics

The Principles of the System.

The principles involved in heating by hot water are very simple, but must be understood and strictly followed to ensure success. The heat is carried from the heater to the radiators by the *circulating* water, and the success of the whole work depends upon free and perfect circulation. The circulation is caused entirely by *gravity*, or by the difference in weight of the water in various parts of the system, and not at all by pressure, as some accustomed to heating by steam are likely to think.

Water is expanded or increased in volume when heated so that a given amount of warm water weighs less than an equal volume of cold water. If water be heated from the freezing to the boiling point there will be an increase of its volume of about one-twenty-third; that is: a column of water twenty-two feet high at freezing point will balance a column of water twenty-three feet high at the boiling point. To heat a cubic foot of water from 32° to 212° would not reduce its weight, but it would increase its volume to one and one-twenty-third cubic feet; so that a cubic foot of the boiling water would weigh one-twenty-third less than the cubic foot at the freezing point.

When the system is completed it is, with the exception of the expansion tank, entirely filled with water; and since the temperature is the same at all points there will be perfect equilibrium and consequently no movement. Upon lighting the fire in the heater the water at that point, made specifically lighter by heating than that in the rest of the system, is displaced and forced upward by the cold water from the return pipes. Thus a circulation is established, upward in the flow pipes and downward in the return pipes, which continues so long as there is any difference in the temperature of the water in the system.

The circulation of water *below the boiler* is practicable, and when necessary can be readily accomplished by proper piping. Sufficient difference in weight must be secured by *loss of heat above the boiler* to overcome the tendency of the cooled water to remain at the lowest point of the system. This is best accomplished by placing the radiators below the heater on the return from the upper radiators.

The rapidity of the circulation, other things being equal, depends upon the difference in temperature, and therefore difference in weight of the water in the flow and return pipes. Free circulation is prevented or retarded by numerous angles, too small pipes, air traps, etc., but when the principles are understood and care and good judgment are exercised, hot water heating becomes easy and satisfactory.

THE HOT WATER "PLANT."

BOILERS.

The first and most important part of the apparatus would seem to be the source of heat, or heat generator—THE BOILER. This may be looked upon as a machine constructed with a two-fold purpose, namely: to *convert fuel into heat* and *to impart the generated heat to the surrounding water.*

In constructing heating boilers it is necessary to maintain a proper balance between these two parts of the work. Some boilers are most excellent for converting fuel into heat. In them "the combustion is perfect" and as *coal consumers* they are undoubted successes and blessings to the coal merchants. On the other hand, some attempt to save so much heat that their heaters are altogether unfit for domestic or private use, because their complicated construction and the light material of which they are built, necessitates frequent cleaning and constant expense for repairs. Such boilers work splendidly at first, but their race is soon run. The ideal heater represents the "happy medium" between the two extremes just mentioned. It is the boiler with sufficient heating surface to prevent an extravagant consumption of fuel, but without so much surface in complicated tubes, etc., as to cause an extravagant expenditure of labor and time (quite as costly as fuel) in keeping them in working order.

In considering the merits of a boiler the design of its construction must be kept in mind. THE MAHONY HOT WATER HEATER *is especially designed for heating residences*, and admirably answers the purpose. Many engineers and dealers pay attention to the *extent* of the heating surface to the exclusion of the consideration of other equally important points and without appreciating the difference in *effectiveness* and *power* between direct surface, exposed to radiant heat and indirect or flue surface.

In connection with this subject we take the liberty of quoting the opinion of Mr. Wm. J. Baldwin, in his standard work, "Steam Heating for Buildings," in which the description of the best heater for residences closely fits the Mahony Boiler.

Mr. Baldwin writes as follows: "The direct heating surface of a boiler (fire-box) has a value several times greater than the indirect surface (flues and tubes); but the shape of the furnace, its size and the angle of the heating surface, as well as the length, size and position of its flues, give a greater or less value to the indirect surface; but these values are only *comparative.*

"In constructing boilers for heating apparatus, an effort should be made to have the greatest amount of direct surface with a minimum of indirect surface; for it is desirable to have slow combustion with thick fires, and thus reduce the attendance to a minimum.

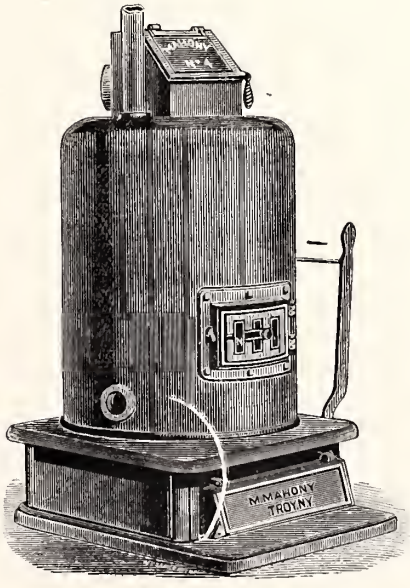
"When furnaces are comparatively small with a high rate of combustion, flue surfaces may be lengthened with beneficial results; but in a private house with a self-feeding boiler (base burner), or one which has a deep furnace, constructed to put in six to eight hours' coal, a great part of the heating surface should be in the fire-box; the heat from the gases being comparatively low-tempered and the amount passed in a given time small. * * * * * * * * * All that can be gained by *crowding* the fire-pot with surfaces, hanging or otherwise, is, to reduce the bulk of the boiler; the surfaces will be the same size still, for the same work. It is therefore poor economy to reduce the size when nothing else is gained, and make surfaces which will fill up on the inside with sediment, choke up in the tubes or between them with soot and ash, and wear out in one-third of the ordinary time.

"It is an incontrovertible fact that boilers with very small parts require more surface for the same work than with large and plain parts, because of the impossibility to thoroughly clean them and the rapidity with which they choke, the nearness of the tubes allowing the dirt to *bridge* between them.

"A maximum of fire-box with a minimum of flues is proper, and *should be the rule in all house heating* where there is generally plenty of room in the cellar.

"If the surface of the fire-box be increased by projections or corrugations, for the object of an increase of surface in contact with the highly heated gases of the furnace, they should be large and in vertical rows, so nothing can find lodgment on them.

"The boilers which have given the best evaporative results as well as the least trouble and lasted the longest, have been the simplest, and the evaporative results of boilers depend more on the care with which they are kept clean, and the unimpeded circulation of the water within them, than upon any *peculiar disposition* of the heating surfaces."



THE MAHONY HOT WATER HEATER.

SELF-FEEDING.

This heater is designed to embrace all the essential features of a successful *residence heater*, which is usually cared for by domestics or members of the family. It is claimed that in this heater will be found more good points and less bad ones than in any offered to the Trade.

It is a magazine heater, and will maintain a steady fire for from ten to eighteen hours in the coldest weather.

It is a cast-iron heater, and made so heavy that it will last for very many years.

It has no joints packed with rubber nor asbestos, and will never become leaky.

It requires no brick work, and can be set up complete in from thirty minutes to two hours.

It has no flues to clean nor any surfaces to become choked with soot.

It has the patented MAHONY ROCKER GRATE with standing shaker, and can be cared for without soiling the clothing.

It is built on correct principles, and the circulation is not impeded by horizontal sections nor small openings.

It has more effective heating surface in proportion to its grate area than any heater on the market.

It has no brick lining to deaden the heating surface or require frequent repairs.

It is neat in appearance, compact in form, easy to handle, and free from dust and gas.

It will not explode, and can be safely operated under eighty pounds pressure.

It is the cheapest boiler made for the heating power it develops.

The Mahony Heater consists of two very heavy shells of cast iron, the one fitting within the other, forming the water space between them. These shells are fastened together by numerous screw-studs and the joints are then caulked with iron filings, making the whole boiler practically one solid piece of iron. The fact that the heaters are packed ready for use, prior to shipment, saves dealers much annoyance, as it is frequently found difficult and sometimes impossible to prevent the joints on sectional boilers from leaking, owing to the very unequal expansion.

The self-feeding magazine, besides ensuring a uniform fire for a long time without attention, also serves to divide the flame and force it into contact with the heating

surfaces. In surface-burning boilers the fire is often low in the morning, and must be attended to several times or it takes a long while to warm the house. The magazine does not interfere with the use of the heater as a surface-burner during the day, if desired; while by filling it during the night a quick strong fire is found in the morning, when it is most needed.

The patent Rocker Grate is one of the most practical, durable and convenient grates in use. The standing shaker gives a leverage which enables a child to clean the fire, while the ashes and cinders are ground very fine, there being nothing left to sift.

The Mahony Heater is manufactured to meet the demand of the Trade for a reliable, powerful and cheap boiler which *will do the work.* It has given great satisfaction in its plain form, without the return flue jacket. To meet the demand for the best and *most economical* boiler the *Return Flue Jacket* has been added. This jacket, while increasing the first cost of the heater about twenty-five per cent., effects a saving of fuel which fully offsets it. On this point we again quote from Mr. Baldwin: "Reverberatory or drop flues in upright boilers save much heat. A cause of loss of heat in upright boilers (and possibly many others) * * * * * * * * is, the heated gases find the tubes directly over the fire and pass out rapidly at a high heat, of their own gravity, leaving the outer rings of tubes inert, as may be seen in any upright boiler where the tubes of the outer circles are clogged with dirt, the velocity of the draft in the middle tubes keeping them comparatively clean. But where there is a row of drop tubes, or a flue built around the outside of the shell of boiler with the chimney flue leading from the bottom, the gases are then drawn out or exhausted by the heat in the chimney; and the gases around the upper part of the boiler become uniform in temperature and stratify, the lowest being drawn off first and the others following according to their temperature.

"When combustion is good and the gases as they leave the boiler and enter the chimney flue have not too high a temperature, *the water within such a boiler has absorbed all the available heat;* hence to increase the surface of such a boiler will not do much good unless the grate surface is also increased, since *all* the heat has been absorbed."

Experiments on this point, made with the greatest care and accuracy, showed the highest temperature to which it was possible to heat the gases at their exit from the return flue jacket, *to be from 200° to 400° lower* than from sectional boilers under like circumstances.

Systems of Hot Water Heating.

Heating by hot water is usually and preferably done by what is known as the "Low Pressure" or "open" system, in which the over-flow pipe from the expansion tank is always open to the atmosphere. By this method of heating no increase of pressure can be caused by increase of heat; so that there is no possibility of an explosion from neglect or other causes. It is expected in the open system, to accomplish the heating by having such an amount of radiating surface, that in the coldest weather the water will just be heated to the boiling point; such heating being the pleasantest, most uniform, and most economical of fuel, though it is the most expensive to introduce, because of the large amount of heating surface required in the radiators.

By closing the over-flow pipe from the expansion tank with a safety valve, the system may be operated under any desired pressure; the object of pressure being to raise the temperature of the water above 212° F., the ordinary boiling point, so that the heating may be accomplished with a correspondingly smaller amount of radiating surface.

The "boiling point" of water depends upon the pressure it is under; the ordinary boiling point being 212° F., because at a pressure of fifteen pounds per square inch, or atmospheric pressure, water becomes steam at that temperature. If the pressure be decreased, steam will be formed at a lower temperature, while if the pressure be increased a higher temperature must be obtained to boil the water.

It must be remembered that to increase the temperature there must be an increase of pressure; so that to obtain a very high temperature, there must be very great pressure in the whole system, as shown in the following table of pressures corresponding to given temperatures; the *total* pressures being given. The gauge will therefore indicate the atmospheric pressure, fifteen pounds, less than the table.

TABLE OF PRESSURES CORRESPONDING TO GIVEN TEMPERATURES.

212	degrees	Fah.,	15	pounds	pressure.
228	"	"	20	"	"
240	"	"	25	"	"
250	"	"	30	"	"
258	"	"	35	"	"
267	"	"	40	"	"
283	"	"	50	"	"
295	"	"	60	"	"
306	"	"	70	"	"
315	"	"	80	"	"
324	"	"	90	"	"
332	"	"	100	"	"
341	"	"	120	"	"
358	"	"	150	"	"
380	"	"	200	"	"
400	"	"	250	"	"
408	"	"	300	"	"

GENERAL DIRECTIONS.

While, of course, it is impossible to give directions so plainly and definitely that those unaccustomed to the work will understand how it is done, we endeavor to explain the various points, and make such suggestions as may benefit those about to introduce the system of heating with hot water.

THE BOILER.

The principal direction to give about the boiler, is to be certain it is ample for the work without forcing or frequent attention. If a "No. 2" Boiler will do a certain amount of work, the "No. 3" will do it easier, better, and cheaper. If you need a boiler to heat, say, four hundred feet of surface, get one rated to heat six hundred; not because the boiler is over-rated but because all boilers are rated at their full limit of work under the best and most favorable conditions, and no heater should be put in any building, particularly residences, to use its full rated power, because it is seldom under favorable conditions for its best work. Errors may have been made in judging the amount of surface needed for certain work; there is certain to be careless attendance at times; poor fuel may be used or the piping improperly done, but in any case the trouble is sure to be attributed to the boiler, rather than where it should be placed; so start right and get a boiler large enough for the work.

The boiler *may* be placed wherever desired, but it is better that it should be as centrally located as possible.

THE PIPING.

All piping should be laid out with reference to the free passage of the water in the pipes. We do not advise the use of special fittings or any great extra expense for the purpose of avoiding square turns, etc., but wherever "Y's," "45's," and long bends can be used instead of "Tees," elbows and short bends, a gain will be made. Friction in the pipes hinders circulation, and for this reason no smaller pipes than three-quarter inch should be used. On the other hand it is desirable to keep the volume of water in the system as small as possible that the work may be quicker, so that very large pipes are to be avoided.

We advise the use of main flow pipes, from the heater, from which branches are taken, rather than the practice, advocated by some, of taking off nearly as many pipes from the heater as there are radiators to supply.

It is neither necessary nor desirable that the main flow and return pipes shall equal in capacity the total capacities of their branches. The hottest water will seek the highest levels; *gravity* causing an even distribution of the heated water if the surface is properly proportioned.

The plans shown in this circular will suggest a good arrangement of the system, though the sizes of pipes given are larger than really necessary.

As in hot air heating, the supply pipes running to the highest points should be proportionally smaller than those to first floors. Generally, three-quarters to one inch pipe will supply radiators having less than fifty square feet of surface. One inch to one and one-quarter inch pipe should be used for larger radiators.

All flow and return pipes should be run side by side over head in the cellar, and securely fastened by hangers; due provision being made for their expansion and contraction.

THE RADIATING SURFACE.

All radiators should be placed as near the cooling surfaces—the windows and outer walls—as possible, to prevent currents of cool air across the floors. The kind of radiator is not important, so long as proper provision is made for the expulsion of all the air and free circulation of the water. Wrought iron pipe coils are rather more effective than cast iron radiators, though not so convenient for use in residences.

EXPANSION TANK.

For receiving the increased volume of the water in the system when it is heated, a tank, usually made of heavy galvanized iron, is provided. This is usually made in neat form; from ten to fifteen inches in diameter, and sixteen to twenty-four inches high, of sufficient capacity to hold about one-twentieth of the water in the entire system. There should be a half-inch pipe connecting the bottom of the tank to the return pipe or boiler *at the lowest point in the system;* this being quite important to prevent trouble if the water boils. From near the top of the tank there should be a three-quarter inch over-flow pipe running to outside the building, or to some drain where water would do no harm.

In case the over-flow pipe drops below the tank there should be a small open pipe from the top of the tank to admit air, and thus prevent syphoning the water out of the upper part of the system.

A water glass should be placed on the side of the tank to show the heighth of the water in the system.

VALVES.

Every radiator or coil should be provided with a valve which may be placed either on the flow or return pipe for controlling the circulation, and regulating the amount of heat given out.

It is well to provide the flow and return pipes near the heater with gate valves, and small draw-off cocks, so that parts of the system may be shut off or disconnected without affecting the balance.

All radiator and other valves in the circulating system should be "gate" or similar valves, having full openings, to permit the free passage of the water.

Air-Cocks must be placed *at the highest point* on all radiators, or coils, to permit the escape of the air when the system is filled; or the admission of air when the system is to be emptied. Should it be necessary to trap the pipes to go under or over doors, etc., there must be an air-cock at the highest point of the trap to release the air, since an air trap prevents the circulation of the water, just as a water trap prevents the circulation of steam.

THE WATER SUPPLY.

Provision must be made for filling and emptying the system. Where there is a water supply, connection is made with it and a valve controls the amount admitted. Where there is no water supply a funnel may be placed on the expansion tank and the system filled by hand at that point. After the system is once properly filled, care having been taken to expel all the air from pipes and radiators, *there is practically no loss of water*, a pint per month being sufficient generally to balance the loss.

For emptying the system a valve must be placed at the lowest point, so that all the water may be withdrawn if desired; as, when the house is not occupied during cold weather and fire is not maintained.

It is well to empty the pipes several times at first to clear them of oil and dirt, after which the system, if filled with good clear water, preferably rain water, will not need changing for years.

The management of the heater is very simple and requires little instruction. It is important that the magazine be filled full at night, that there may be a supply of coal in the morning when a quick fire is desired. The grate must be thoroughly cleared in the morning and well shaken at night before filling the magazine. Always remove ashes from the heater as soon as shaken down, that the grate may not be injured.

METHODS OF HEATING.

Residences are principally heated by *direct radiation*, in which system the radiators stand within the rooms and heat the air contained in them. This system is the cheapest and least expensive for fuel, but no provision is made for ventilation. Where a supply of fresh warmed air is desired it is secured by *indirect radiation*, or placing a radiator within a fresh air duct, by which the incoming air is warmed and then conveyed to the rooms above by tin pipes through registers, as in furnace heating. Nearly double the surface required by "direct radiation" is needed in heating by "indirect."

HOW TO ESTIMATE.

We are constantly called upon for advice upon this subject, and are glad to give all the assistance we can, but the conditions vary so much in different buildings of the same size that definite rules cannot be given. The first question to be settled, is, the amount of radiating surface required to heat the building. In determining this point, the location and exposure of the building, the material of which it is constructed; the manner in which it is built; the temperature to which the various rooms must be warmed; the probable care the apparatus will receive; the size of the building—small rooms and small buildings requiring much more surface in proportion than large ones,—and its use, must all be considered, and good judgment must be used, in deciding properly how the conditions found will affect the amount of heat required. *Keep on the safe side*, since there can be no discomfort, as in steam heating, from too great surface, since the temperature can be controlled by the fire, and a large surface at a low temperature is much more healthful and economical than a small surface highly heated.

It is found in practice—using the open system—that in a fairly well constructed residence, of medium size, exposed on all sides, a proportion of one square foot of direct radiating surface to from twenty-five to thirty cubic feet of space is required on the ground floor, to give a temperature of sixty five to seventy degrees Fah., in the coldest weather where the thermometer sometimes indicates thirty degrees below zero. The upper floors will be sufficiently warmed by a proportion of one foot of radiating surface, to from thirty to forty cubic feet of space, provided the warm air is free to rise from the first floor as is usual in most buildings.

Large halls and churches, in fact, large buildings generally, require a much smaller proportion of heating surface to the cubic space than small buildings, because of the much smaller proportion of wall and window surface to the enclosed space. For instance a building twenty feet wide by forty feet long by twenty-five feet high, would have three thousand square feet of wall surface and contain twenty thousand cubic feet; while a building forty feet by forty feet by twenty-five feet would contain double the cubic space with an addition of only one thousand square feet of wall surface. Heating apparatus is used, not so much to heat the air in the building, as to overcome the effects of the cooling surfaces.

In estimating the amount of heating surface, all flow and return pipes must be included with the radiators, unless they are so covered as to prevent the loss of heat.

Having thus determined the total amount of heating surface required, the next step is to decide upon the size of boiler required to do the work. There is a natural tendency on the part of all dealers to select the smallest boiler they dare, in order to keep their figures below those of their competitors; a policy which frequently results in securing contracts, perhaps, but seldom proves profitable or satisfactory. It should be the rule of all dealers to select at least one size larger heater than that rated to do the work required; to allow for careless attendance, or errors in judgment, and to ensure an easy-

working, satisfactory job. Suppose, for instance, that the total heating surface is 600 square feet. The No. 3 boiler will do the work, but the No. 4 boiler will do it easier and cheaper, and should be used, the difference in cost between the boilers being slight, compared with the difference in the manner in which the heating would be accomplished.

DESCRIPTION OF CUTS.

Figure 1, giving the exterior view of the heater, shows the return flue jacket cut away to expose the boiler within Special attention is invited to the neat and substantial appearance of the heater when ready for use. It is as convenient and clean to care for as a parlor stove, and occupies but little more space. The patent *rocker grate* with standing shaker is an important feature, and renders the sifting of ashes unnecessary, no unburned fuel being lost.

Figure 2 gives a clear idea of the construction of the heater, the direction of the draft, the self-feeding magazine, and especially the novel manner in which very extensive and effective heating surface is secured, without the use of flues or horizontal surfaces which can become choked or covered with soot and ashes. Referring to the cut, A is the draft chamber around the magazine; B is the self-feeding magazine, holding a supply of coal sufficient for from ten to eighteen hours; C is the feed door; D is a door through which the fire can be inspected and attended to; E is the ash-box; F is a lift door through which the ashes are removed and by which the draft is regulated; G is the direct draft damper, to be opened when the grate is shaken and the magazine filled; H is the drop-flue smoke-pipe, by which the gases are exhausted at the bottom of the heater; K is the water space, entirely surrounding and hanging over the fire in the heavy folds or pockets, M. These folds are large and plain, they are self cleaning, and cannot become choked with soot. It will be noticed that no rubber nor asbestos packing is employed, while the boiler has not one-tenth the number of joints found in all sectional or wrought iron boilers. The special claim of remarkable economy of fuel, is made for this return flue heater.

DIMENSIONS, HEATING POWER AND PRICE LIST OF THE

MAHONY HOT WATER HEATER, WITH RETURN FLUE JACKET, COMPLETE.

SIZE OF HEATER.	Diameter of Fire-Box.	Diameter of Grate.	Diameter of Jacket.	Height of Heater.	Size of Heater Base.	Height of Return Opening from floor.	Weight of Heater Complete.	Heating Power in sq. ft. of surface.	Heating Power in feet of One Inch Pipe.	Price with Return Flue Jacket.
	inches.	inches.	inches.	inches.	inches.	inches.	lbs.	sq. ft.	lin. ft.	
No. 0, -	10	9	17	51	17 x 20	12½	550	200	600	$ 60
No. 1, - -	13	11½	20	55	22 x 27	14½	850	300	900	90
No. 2, -	17	14½	25	58	26 x 31	16½	1200	500	1500	120
No. 3, - -	21	18½	30	63	29 x 34	17	1700	800	2400	185
No. 4, -	25	22½	35	67	34 x 40	18½	2450	1000	3000	250
No. 5, - -	31	28½	41	73	42 x 50	21	3900	1700	5100	300

EXTERIOR PERSPECTIVE VIEW.

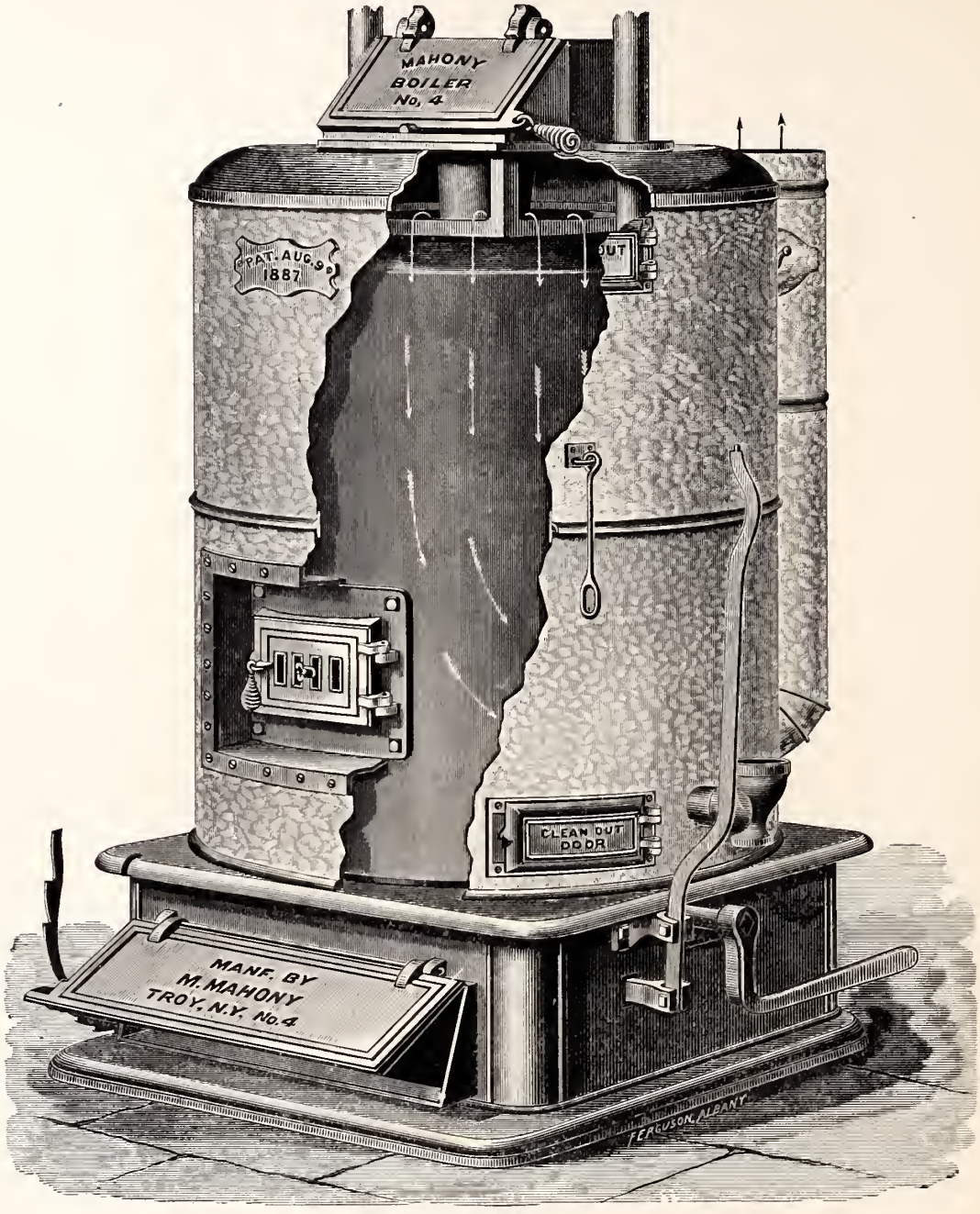


FIGURE 1.

THE MAHONY SELF-FEEDING HOT WATER HEATER

WITH

RETURN FLUE JACKET.

SECTIONAL VIEW.

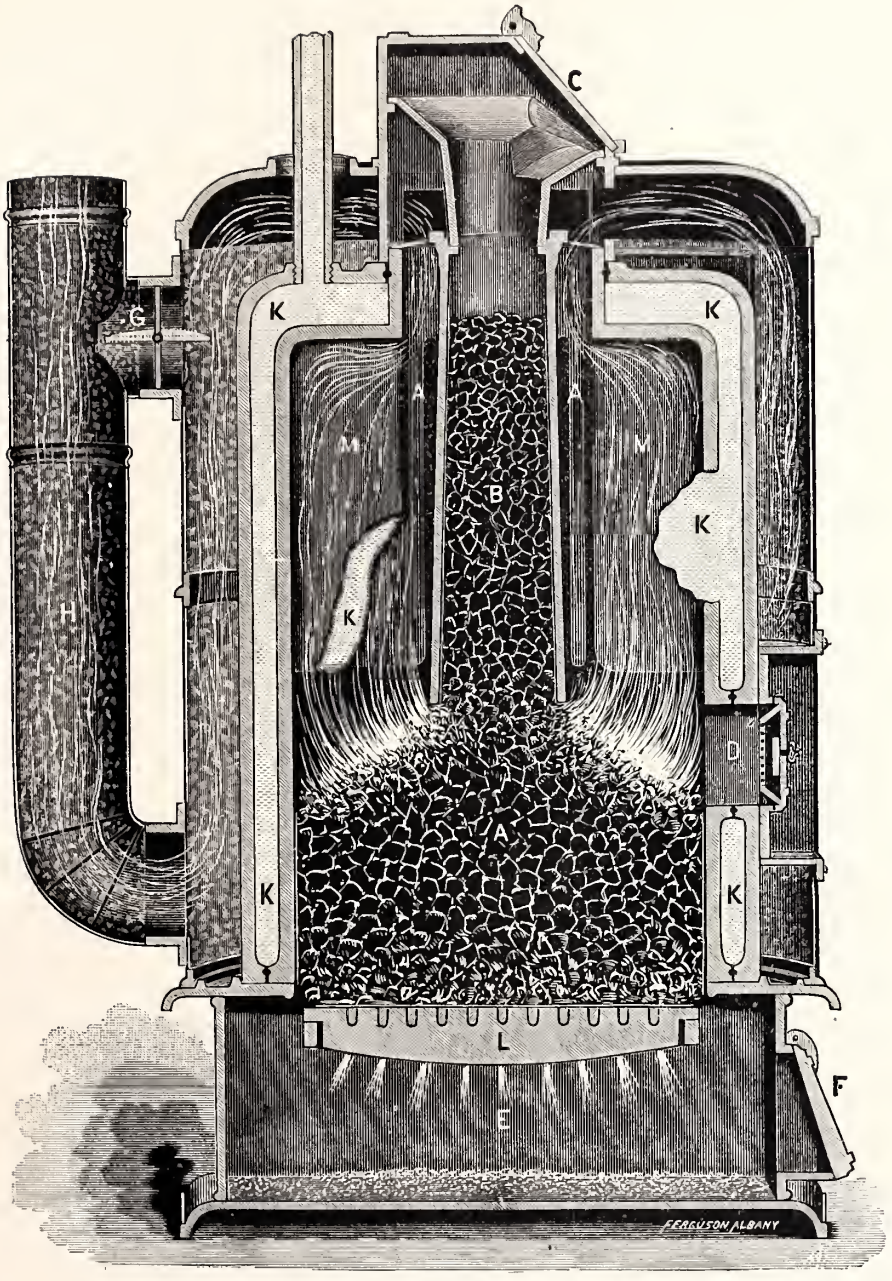


FIGURE 2.

THE MAHONY SELF-FEEDING HOT WATER HEATER

WITH

RETURN FLUE JACKET.

Horizontal Section of the Upper Part of the Heater.

FIGURE 3.

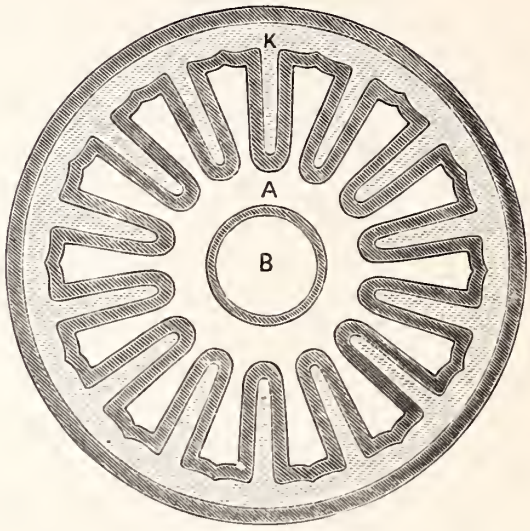
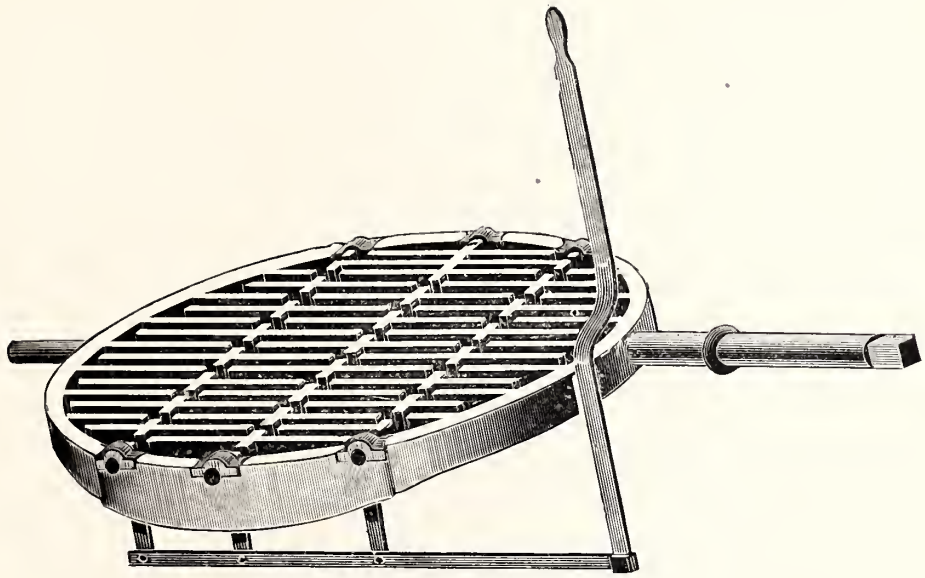
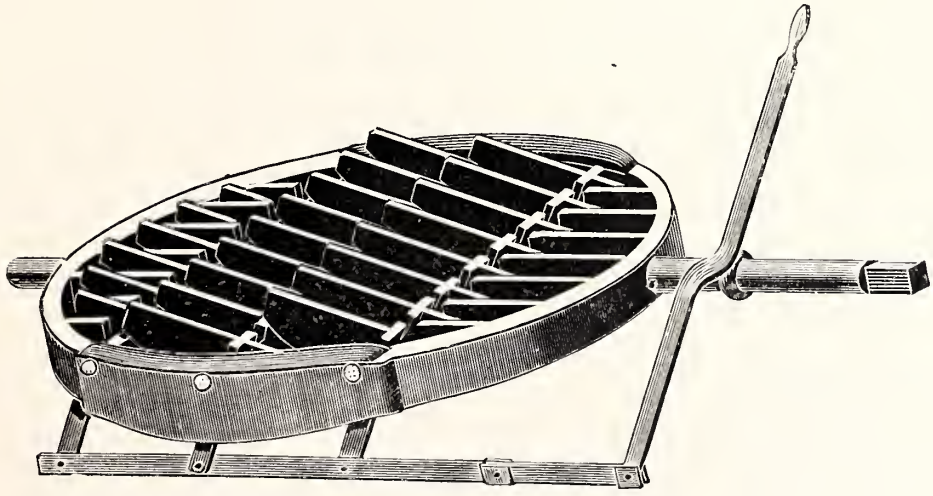


Figure 3, shown above, explains the arrangement of the heating surfaces above the fire in all the styles of heater, except that in the surface-burning heater, the magazine B, is omitted. It will be seen that the water extends over the fire-box, while the flames and gases pass freely between the heavy folds and come in contact with a very great extent of surface. The great advantage of this disposition of the heating surface is, that the circulation is in no way impeded, the surfaces cannot become foul, and the volume of water in the heater is kept very small. Referring to the cut, "K" represents the water space, "A" the fire-space and "B" the magazine.

Figure 4, page 20, shows the exterior of heater without the return flue jacket. In this form the Mahony Heater has won its present excellent reputation, and it represents the simplest, cheapest, and for the cost, the most powerful hot water heater made. While it is not so economical of fuel as the heaters having the return flue jacket, it is fully guaranteed and has always proven as economical as any of its competitors, and in competing with others on the market, this plain heater should be used in making comparisons. No time is lost in setting it up and packing it, as with all sectional heaters, nor is there any danger of leakage or cracking from unequal expansion.

Figure 5 is a sectional and interior perspective view of the plain heater, showing the construction of the inner shell or fire-pot, and the self-feeding magazine. Too great stress cannot be laid upon the fact, that the heating surfaces are all exposed to direct radiant heat, as well as flame contact, and that they cannot become choked with soot and ashes. Another strong point, is the little labor required in filling the magazine and caring for the fire; everything being arranged for convenience and cleanliness.





THE MAHONY ROCKER GRATE.

PATENTED.

EXTERIOR PERSPECTIVE VIEW.

FIGURE 4.

THE MAHONY SELF-FEEDING HOT WATER HEATER WITHOUT JACKET.

SECTIONAL VIEW.

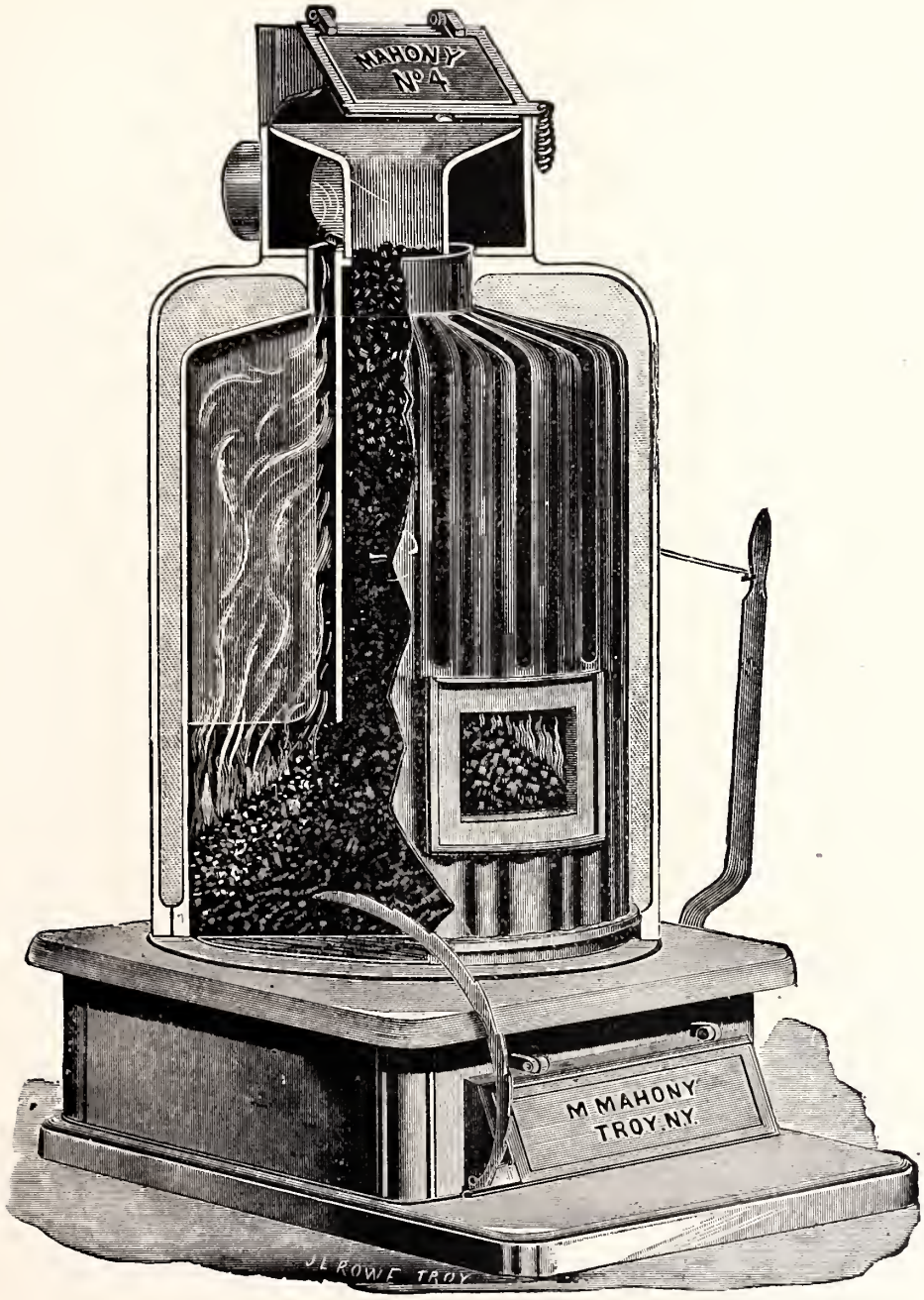


FIGURE 5.

THE MAHONY SELF-FEEDING HOT WATER HEATER WITHOUT JACKET.

DIMENSIONS, HEATING POWER AND PRICE LIST

OF THE

MAHONY HOT WATER HEATER

WITHOUT JACKET.

SIZE OF HEATER.	Diameter of Fire-Box.	Diameter of Grate.	Height of Heater.	Size of Heater Base.	Height of Return Opening from floor.	Weight of Heater Complete.	Heating Power in sq. ft. of surface.	Heating Power in ft. of One Inch Pipe.	Price.
	inches.	inches.	inches.	inches.	inches.	lbs.	sq. ft.	lin. ft.	
No. 0, - - -	10	9	51	17 x 20	12½	500	150	450	$ 40
No. 1, - - -	13	11½	55	22 x 27	14½	800	250	750	65
No. 2, - - -	17	14½	58	26 x 31	16½	1100	450	1350	90
No. 3, - - -	21	18½	63	29 x 34	17	1600	700	2100	140
No. 4, - - -	25	22½	67	34 x 40	18½	2300	1000	3000	190
No. 5, - - -	31	28½	73	42 x 50	21	3600	1500	4500	240

EQUALIZING TABLE OF AREAS OF PIPES.

The number of pipes of any size in left-hand column that are equal to one of given larger diameter will be found where the two sizes intersect in the table. The measurements given are for actual working sizes of pipes.

SIZES OF PIPES.	½-inch.	¾-inch.	1-inch.	1¼-in.	1½-in.	2-inch.	2½-in.	3-inch.	3½-in.	4-inch.	4½-in.	5-inch.
½-inch.....	1.	1.7	2.8	4.9	6.6	11.	15.6	24.	32.	41.	52.	65.
¾-inch.....	.....	1.	1.6	2.6	3.8	6.2	8.9	13.8	18.	23.	30.	37.
1-inch.....	.....	.....	1.	1.7	2.3	3.8	5.5	8.5	11.	14.	18.	23.
1¼-inch.....	.....	.....	.....	1.	1.3	2.2	3.1	4.9	6.6	8.	10.	13.
1½-inch.....	.....	.....	.....	.....	1.	1.6	2.3	3.6	4.8	6.2	7.7	9.7
2-inch.....	.....	.....	.....	.....	.....	1.	1.4	2.2	2.9	3.8	4.7	5.3
2½-inch.....	.....	.....	.....	.....	.....	.....	1.	1.5	2.	2.6	3.3	4.1
3-inch.....	.....	.....	.....	.....	.....	.....	.....	1.	1.3	1.7	2.1	2.7
3½-inch.	.....	.....	.....	.....	.....	.....	.....	.....	1.	1.2	1.6	2.
4-inch.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.	1.2	1.6
4½-inch.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.	1.2
5-inch.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.
Internal Areas of Pipes....	.3048	.5333	.8627	1.496	2.038	3.355	4.783	7.388	9.887	12.73	15.93	19.99

SURFACES AND CAPACITIES OF PIPES.

Sizes of Pipes.	½-inch.	¾-inch.	1-inch.	1¼-in.	1½-in.	2-inch.	2½-in.	3-inch.	3½-in.	4-inch.	4½-in.	5-inch.
1. Outside circumferences of Pipes in inches....	2.652	3.299	4.136	5.215	5.969	7.461	9.032	10.99	12.56	14.13	15.70	17.47
2. Length of Pipe in feet per squ're foot of outside surface...	4.52	3.63	2.90	2.30	2.01	1.61	1.32	1.09	.954	.849	.763	.686
3. Number of square feet of outside surface in ten lineal feet of Pipe...	2.21	2.74	3.44	4.34	4.97	6.21	7.52	9.16	10.44	11.78	13.09	16.56
4. Cubic inches of internal capacity in ten lineal ft. of Pipe	36.5	63.9	103.5	179.5	244.5	402.6	573.9	886.6	1186.4	1527.6	1912.6	2398.8
5. Weight in lbs. of Water in ten lineal ft. of Pipe	1.38	2.31	3.75	6.5	8.8	14.6	20.8	32.1	43.6	55.4	69.3	86.9

Table giving Openings of Flow and Return Pipes of Mahony Water Circulator.

Size of Heater.	Openings for Flow Pipe.		Openings for Return Pipe.		Combined Areas of Flow Pipes.	Combined Areas of Return Pipes.
	number.	size.	number.	size.		
No. 0.....	2	1¼ in.	2	1¼ in.	2.98 in.	2.98 in.
No. 1.....	2	1½ in.	2	1½ in.	4.06 in.	4.06 in.
No. 2.....	2	2 in.	2	2 in.	6.7 in.	6.7 in
No. 3.....	2	2½ in.	2	2½ in.	9.56 in.	9.56 in.
No. 4.....	2	3 in.	2	3 in.	14.76 in.	14.76 in.
No. 5.....	2	4 in.	2	4 in.	25.46 in.	25.46 in.

EXTERIOR PERSPECTIVE VIEW.

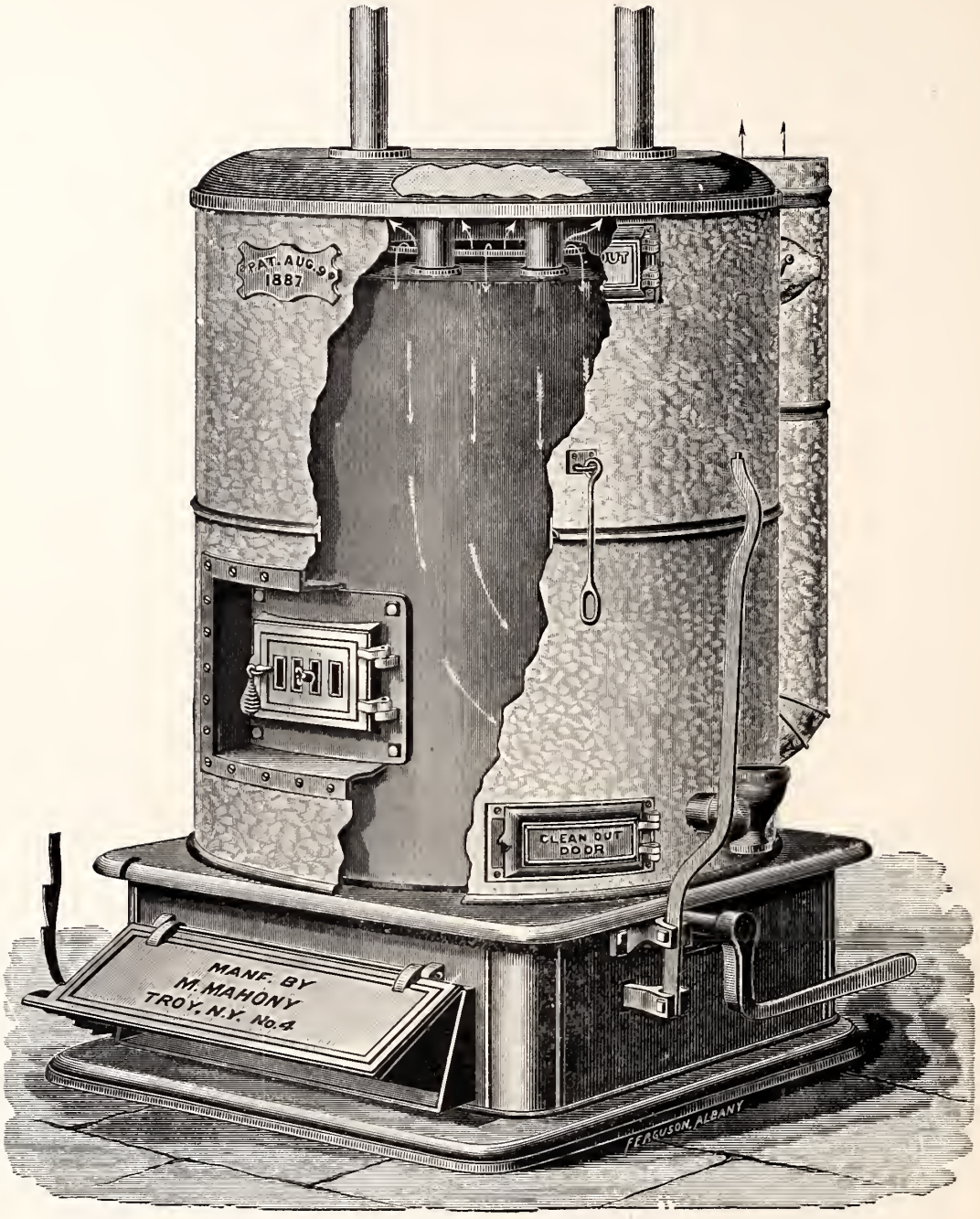


FIGURE 6.

THE MAHONY SURFACE-BURNING HOT WATER HEATER
WITH
RETURN FLUE JACKET.

SECTIONAL VIEW.

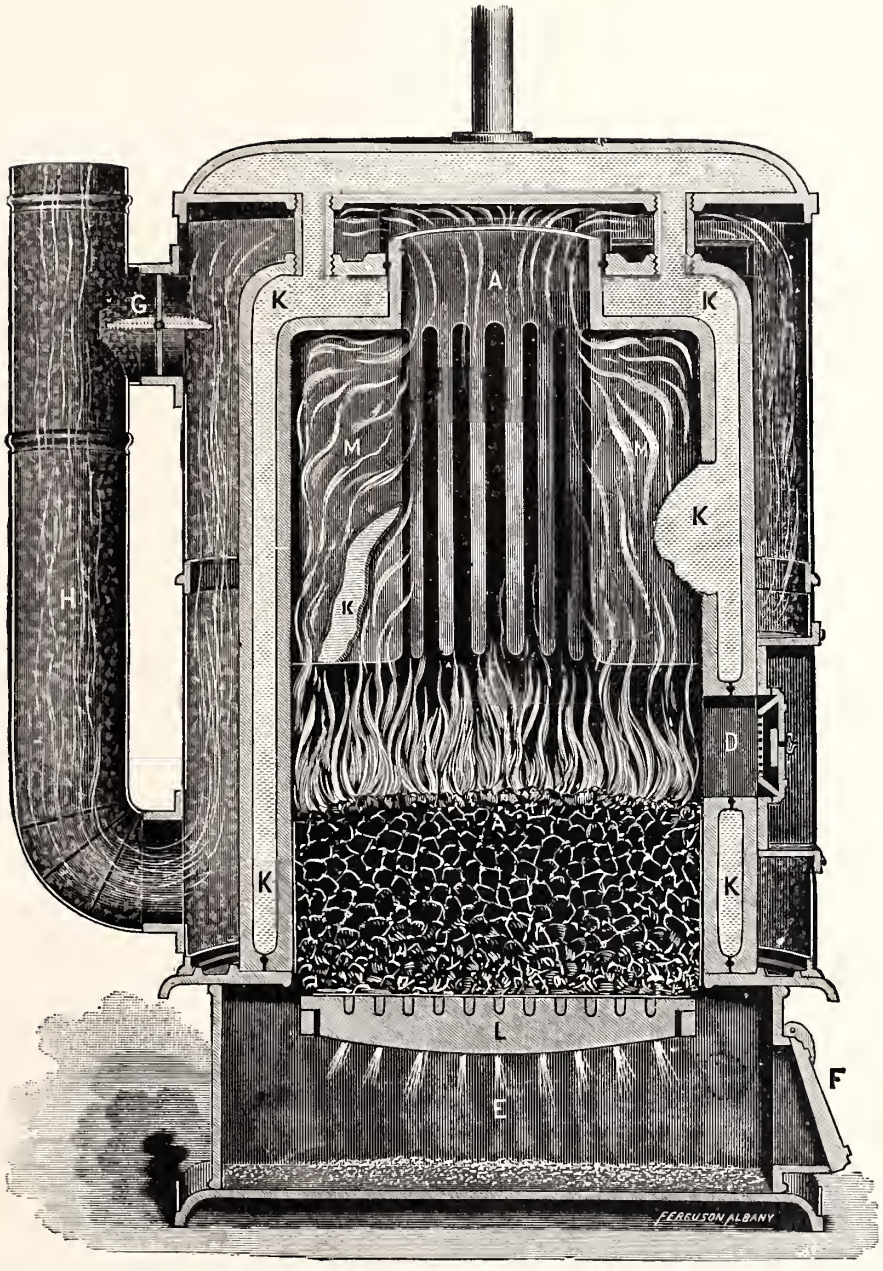


FIGURE 7.

THE MAHONY SURFACE-BURNING HOT WATER HEATER

WITH

RETURN FLUE JACKET.

THE SURFACE-BURNING HEATER.

In figures 6 and 7 are shown the exterior and interior views of our new Hot Water Heater, made as a surface burner. On the comparative merits of the two methods of firing—self-feeding or surface-burning—there is diversity of opinion among engineers and the trade. We consider the self-feeding form the one calculated to secure the most uniform temperature with the least frequent attention, a very important consideration in heating residences. Many claim, however, that greater power can be obtained from same size boiler and from a given amount of fuel by using the surface-burning form.

To meet the demand of some of our customers, the surface-burner has been produced, and it certainly justifies the expense involved in its construction. Always adhering to our rule that *free circulation* is the prime essential of a hot water heater, while *self-cleaning heating surfaces* are next in importance, we still increase the effective heating surface by the removal of the magazine and the addition of the upper water-section. This upper section is joined to the main boiler by "right and left" nipples, and is all connected prior to shipment. The fire-pot is deep, and will hold sufficient coal to maintain the fire for from six to twelve hours in coldest weather. No sectional boiler can compare with this for clean and effective heating surface, free circulation, perfect combustion, or economy of fuel.

DIMENSIONS, HEATING POWER AND PRICE LIST

OF THE

SURFACE-BURNING

MAHONY HOT WATER HEATER

WITH RETURN FLUE JACKET COMPLETE.

SIZE OF HEATER.	Diameter of Fire-Box.	Diameter of Grate.	Diameter of Jacket.	Height of Heater.	Size of Heater Base.	Height of Return Opening from floor.	Weight of Heater Complete.	Heating Power in sq. ft. of surface.	Heating Power in feet of One Inch Pipe.	Price.
	inches.	inches.	inches.	inches.	inches.	inches.	lbs.	sq. ft.	lin. ft.	
No. 0, -	10	9	17	48	17 x 20	12½	550	200	600	$ 60
No. 1, - -	13	11½	20	50	22 x 27	14½	850	330	1000	90
No. 2, -	17	14½	25	53	26 x 31	16½	1200	600	1800	120
No. 3, - -	21	18½	30	56	29 x 34	17	1700	1000	3000	185
No. 4, -	25	22½	35	60	34 x 40	18½	2450	1200	3600	250
No. 5, - -	31	28½	41	62	42 x 50	21	3900	2000	6000	300

Proportions of Radiating Surfaces to Space to be Heated.

One Square Foot of Radiating Surface will Heat	In Dwellings, School Rooms, Offices, etc.	In Halls, Stores, Lofts, Factories, etc.	In Churches, Large Auditoriums, etc.
Low Pressure Direct Hot Water Radiation.....	25 to 50 cubic feet.	35 to 65 cubic feet.	70 to 130 cubic feet.
High Pressure Direct Hot Water Radiation.....	40 to 70 "	65 to 90 "	130 to 180 "
Low Pressure Indirect Hot Water Radiation.....	15 to 40 "	25 to 50 "	50 to 100 "
High Pressure Indirect Hot Water Radiation.....	20 to 60 "	35 to 75 "	70 to 150 "

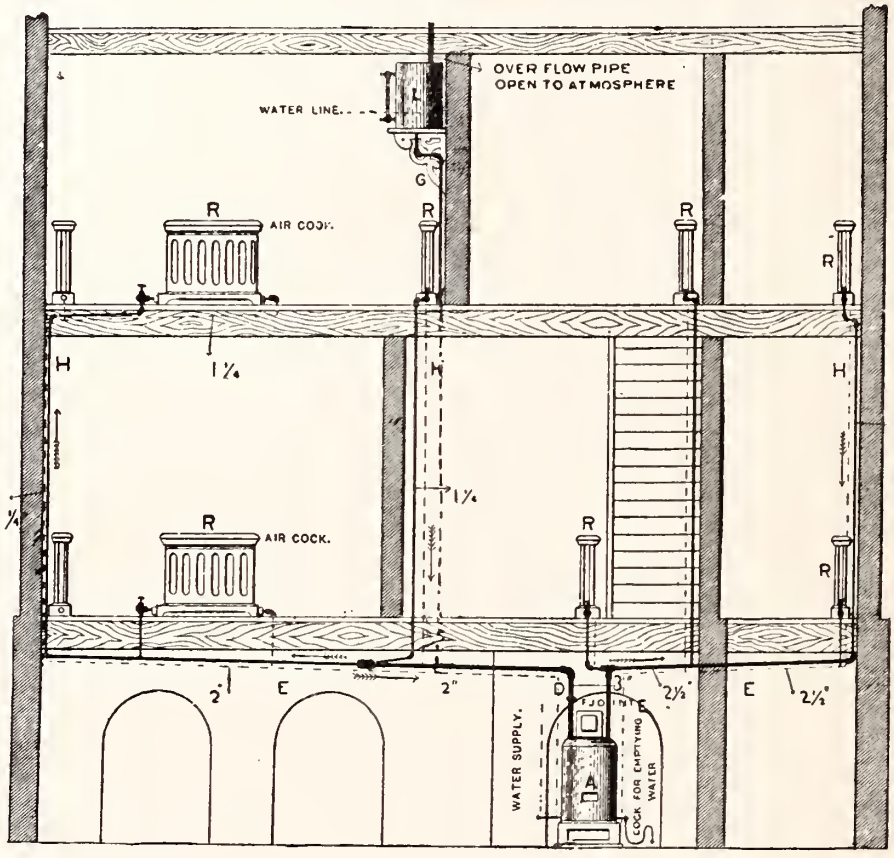
Notice.—The above table is given simply to suggest to the inexperienced the proper amount of surface to use under various conditions, and applies to average cases where the temperature sometimes reaches 25° Fah. below zero. It means that in very much exposed small buildings the lowest estimates should be used, while under more favorable conditions a smaller proportion of surface will do the work, but just what the conditions are must be decided by the heating engineer or party introducing the system.

MANUFACTURER'S GUARANTEE.

The heating capacities have been given for the various sizes and styles of heaters, and they are fully guaranteed at their rated capacity *if under proper conditions.* The figures given represent, as such figures always do, the limit or highest capacities of the boilers when under favorable conditions for good work. By "favorable conditions" it is meant that all pipes not counted as heating surface must be so covered as to prevent loss of heat; there must be the proper amount of radiating surface to heat the rooms when the water reaches the boiling point; the piping must be done so that free circulation of the hot water through the whole system is secured; the chimney must have good draft, the fire must be properly cared for, and the coal must be good. When these conditions are met, and not until then, does the manufacturer assume responsibility for the work of the heaters. As previously stated, it is never wise to expect a boiler to work properly at its full rated capacity, for it is seldom put under favorable conditions for its best work.

Elevation and Plans of Residence, showing Method of Heating by Hot Water Circulation.

SECTIONAL ELEVATION.

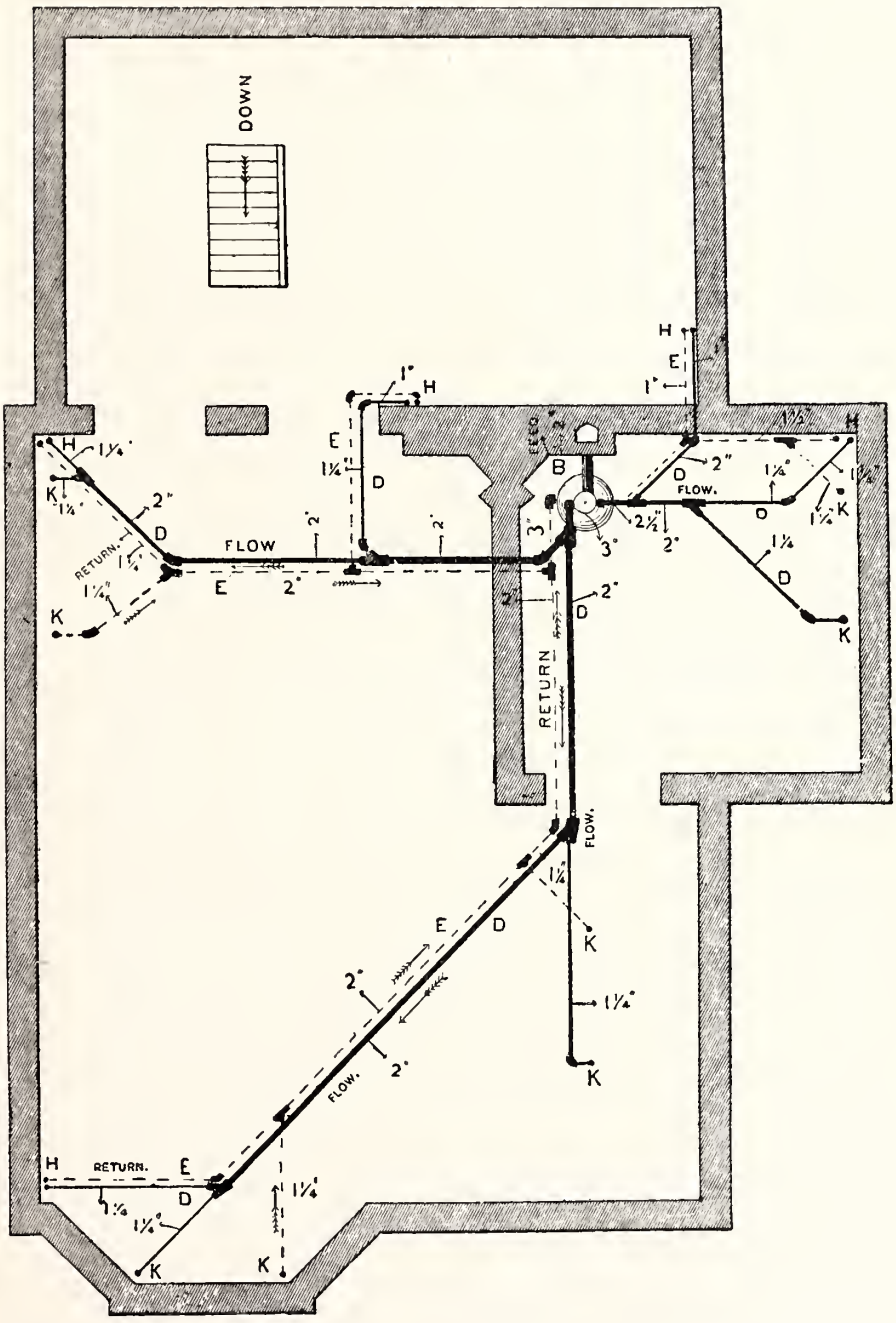


EXPLANATION OF LETTERS USED IN THIS SET OF PLATES.

A. Circulating boiler.
B. Smoke pipe with damper.
D. Main flow and branch pipes.
E. Main return and branch pipes.
G. Connection to expansion tank.
H. Vertical flow and return pipes to radiators on second floor.
K. Flow and return pipes to radiators on first floor.
L. Expansion tank, with water gauge, and overflow pipe.
R. Radiators.

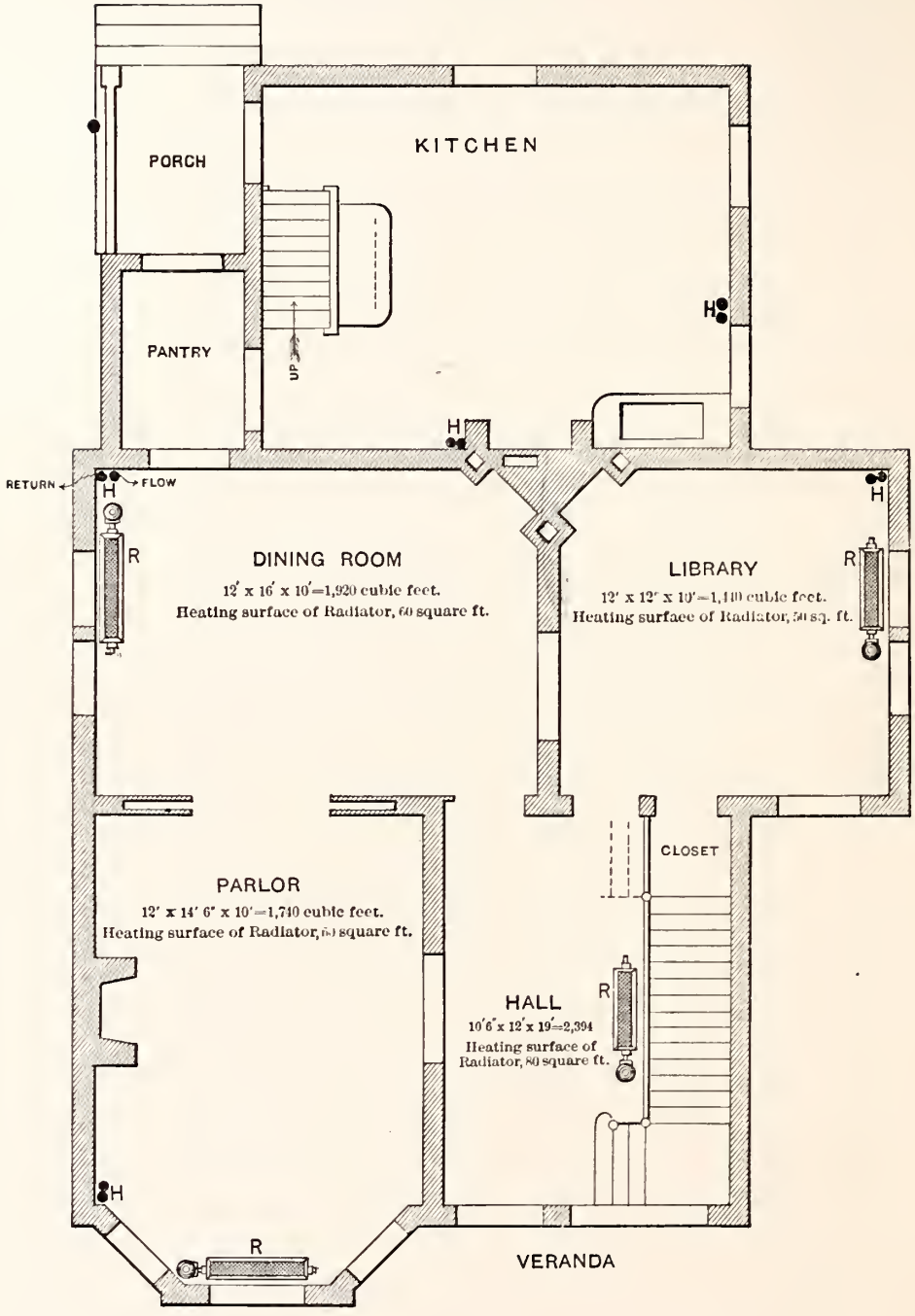
Note.—Expansion tank is connected by one-half inch pipe to return pipe in cellar.

CELLAR.

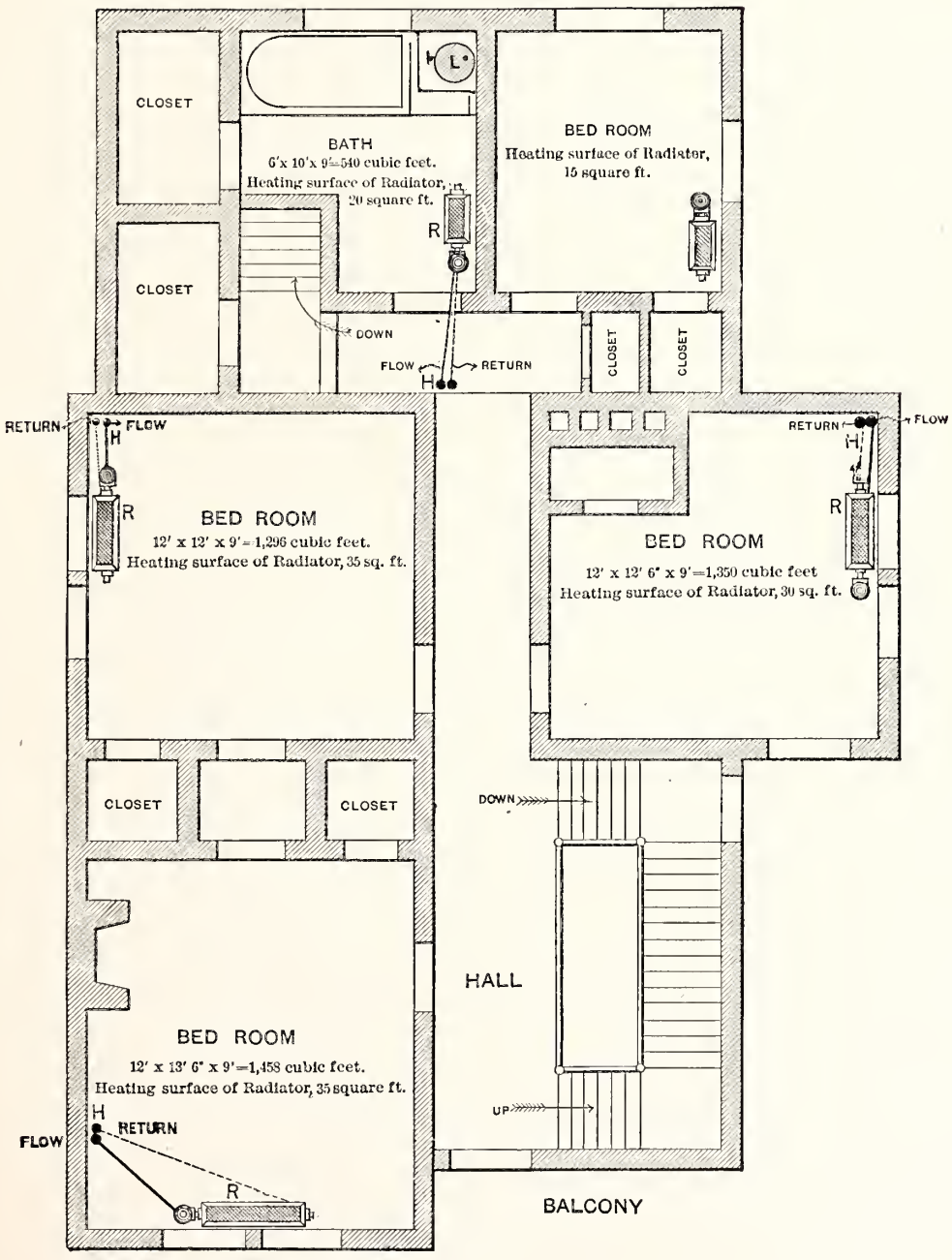


Total capacity of apartments heated,	12,000 cubic feet.
Total heating surface in Radiators,	385 square feet.
Cost of Water Boiler (No. 2, with Return Flue Jacket),	$120 00
Cost of Radiators and Piping,	350 00
Cost of Complete Apparatus,	$470 00

FIRST FLOOR.


PORCH
KITCHEN
PANTRY
UP
H
RETURN
FLOW
R
DINING ROOM
12′ x 16′ x 10′=1,920 cubic feet.
Heating surface of Radiator, 60 square ft.
LIBRARY
12′ x 12′ x 10′=1,140 cubic feet.
Heating surface of Radiator, 50 sq. ft.
CLOSET
PARLOR
12′ x 14′ 6″ x 10′=1,740 cubic feet.
Heating surface of Radiator, 60 square ft.
HALL
10′6″ x 12′ x 19′=2,394
Heating surface of
Radiator, 80 square ft.
VERANDA

SECOND FLOOR.



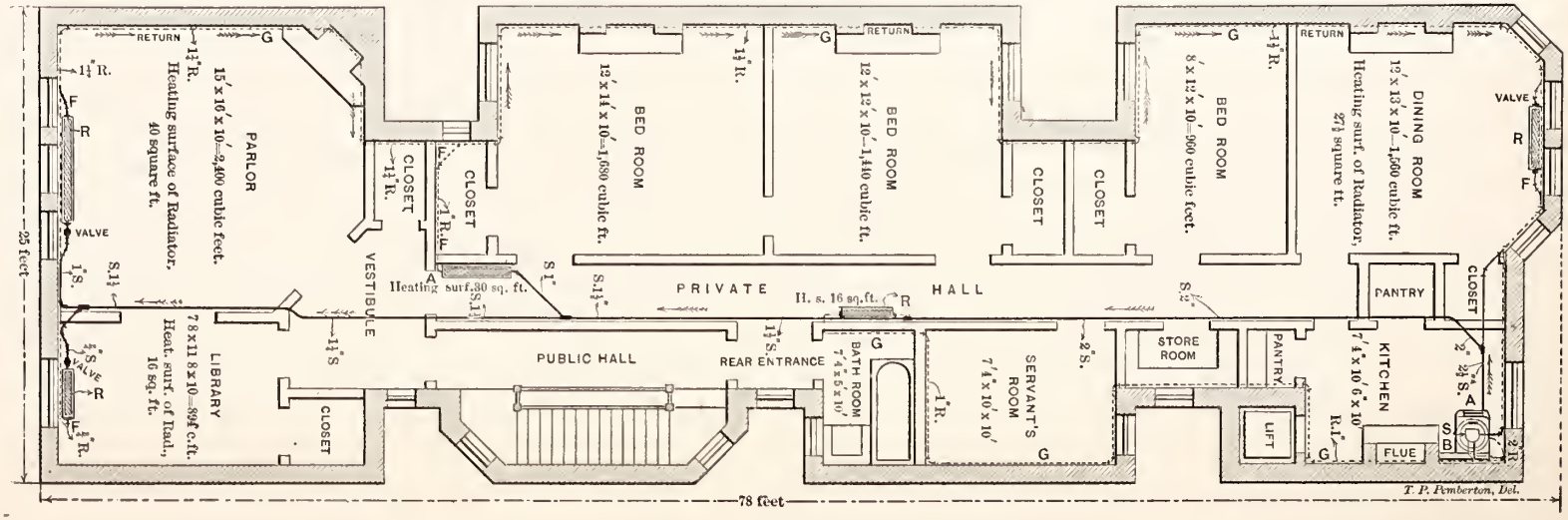
PLANS AND ELEVATIONS

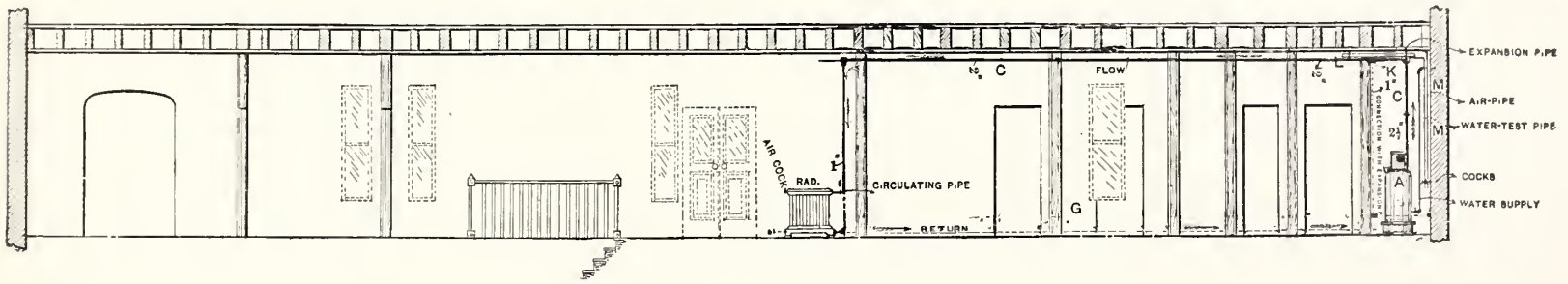
SHOWING

WATER HEATING APPARATUS FOR A FLAT

WITH

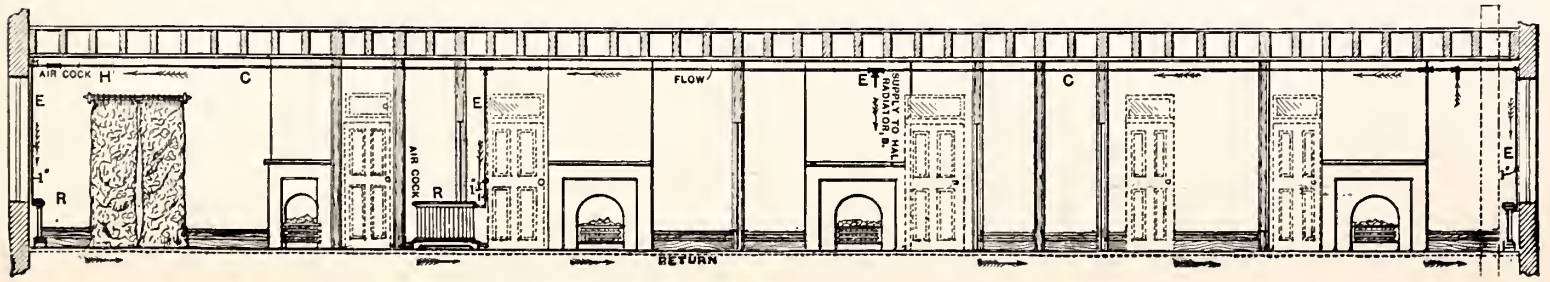
BOILER AND RADIATORS ON ONE FLOOR.





EXPLANATION OF LETTERS USED.

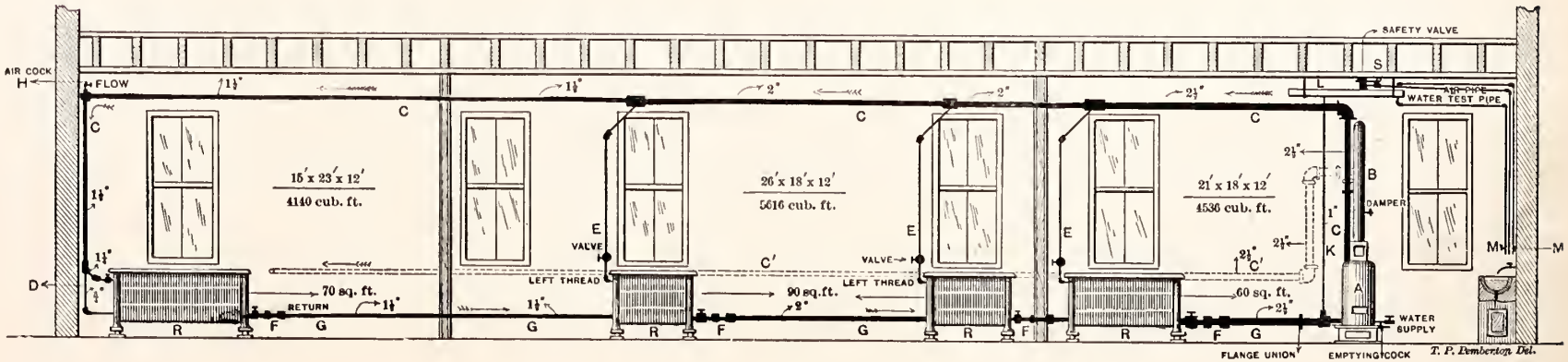
A. Circulating boiler.
B. Smoke pipe with damper.
C S. Main flow pipes.
E. Flow or supply pipes to radiator.
F. Return pipes from radiators.
G" R. Main return pipes.
H. Air cock.
K. Connection to expansion pipe.
L. Expansion pipe
M. Air and water test pipes with cocks.
R. Radiators.



WATER HEATING APPARATUS FOR OFFICES, STORES, ETC.

WITH

BOILER AND RADIATORS ON ONE FLOOR.



EXPLANATION OF LETTERS USED.

A. Water circulating boiler.

B. Smoke pipe with damper.

C. Main flow pipe with flange union.

C′. Main flow pipe as by dotted lines passing below windows and at back of radiators.

D. Circulating pipe.

E. Flow pipes to radiators with gate stop valves.

F. Radiator connections to main return with gate stop valves.

G. Main return pipe.

R. Radiators.

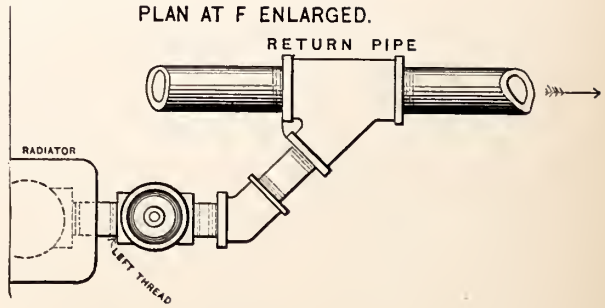
H. Air cock on high end of main flow pipe.

K. Connection to expansion pipe.

L. Expansion pipe on hangers with air and water test pipes and safety valve.

M. Air and water level test cocks, and safety valve waste pipes at some convenient point near basin or sink or above pail. These cocks, etc., are used only when starting apparatus.

S. Safety valve with waste pipe; this only operates when excessive firing occurs.



SOME RADIATORS.

We are very frequently asked by those about to introduce new heating apparatus, what Hot Water Radiators look like. There are numerous forms, varying in price, effectiveness, and style of finish. Just which are the best forms to use depends more upon the "taste and fancy" of the buyer, than upon any particular difference in merit between the products of leading manufacturers. It is sometimes necessary to make special sizes in order to get within a given space; or it is often the case that dealers prefer to make their own radiators to keep their men busy during the dull season. Such radiators are neatly made of pipes with cast iron fittings, and are the most effective form for water heating. See the samples given below in figures 8 and 9.

FIGURE 8.

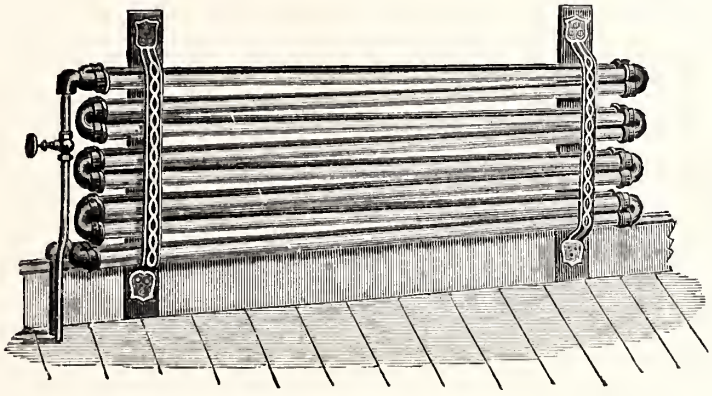


Figure 8—Two-row wall coil, convenient for use in narrow hallways, etc.

FIGURE 9.

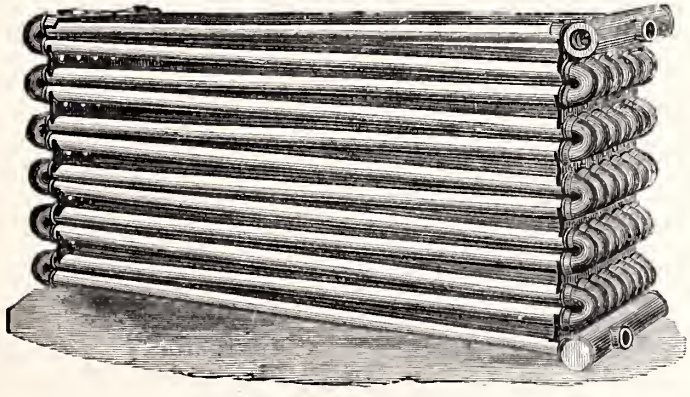
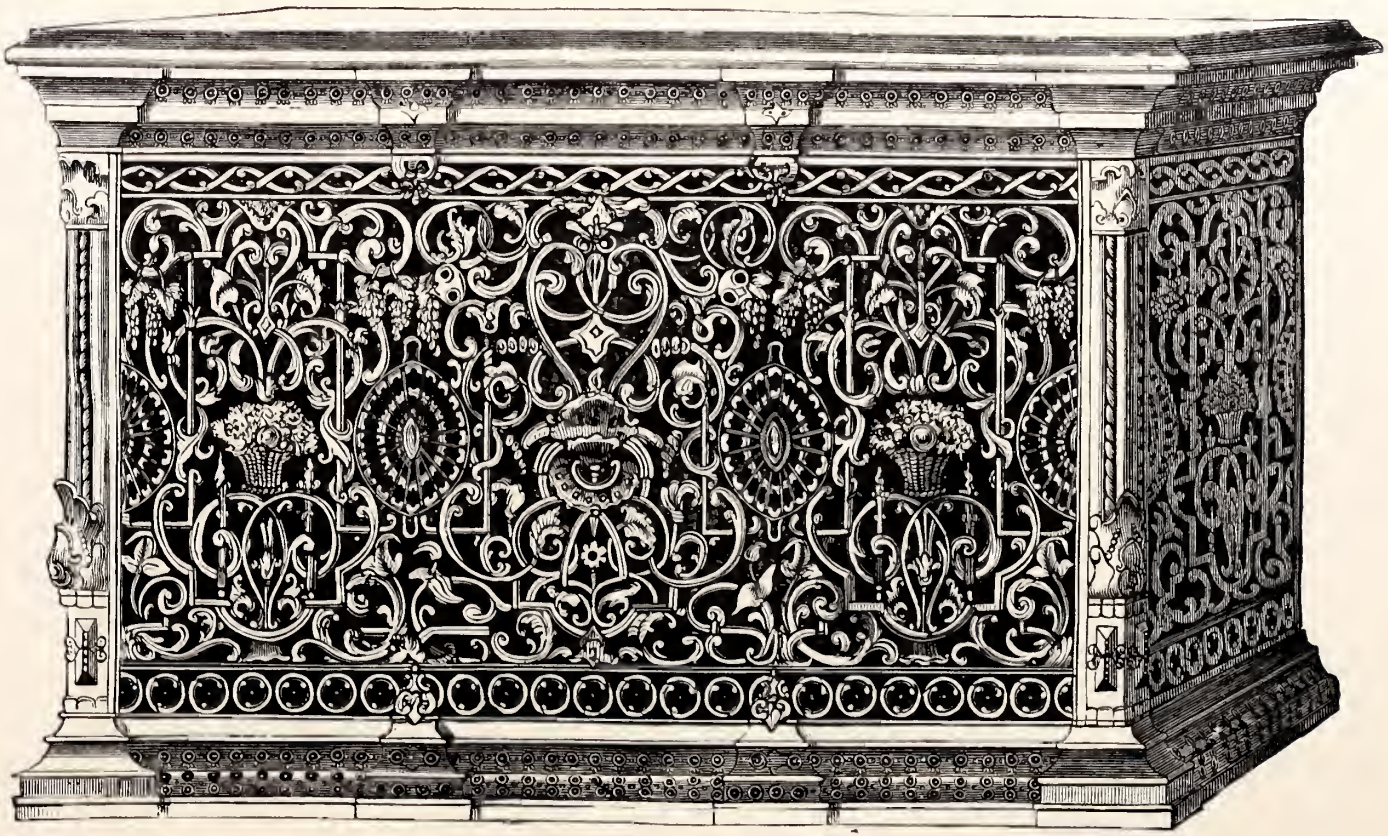


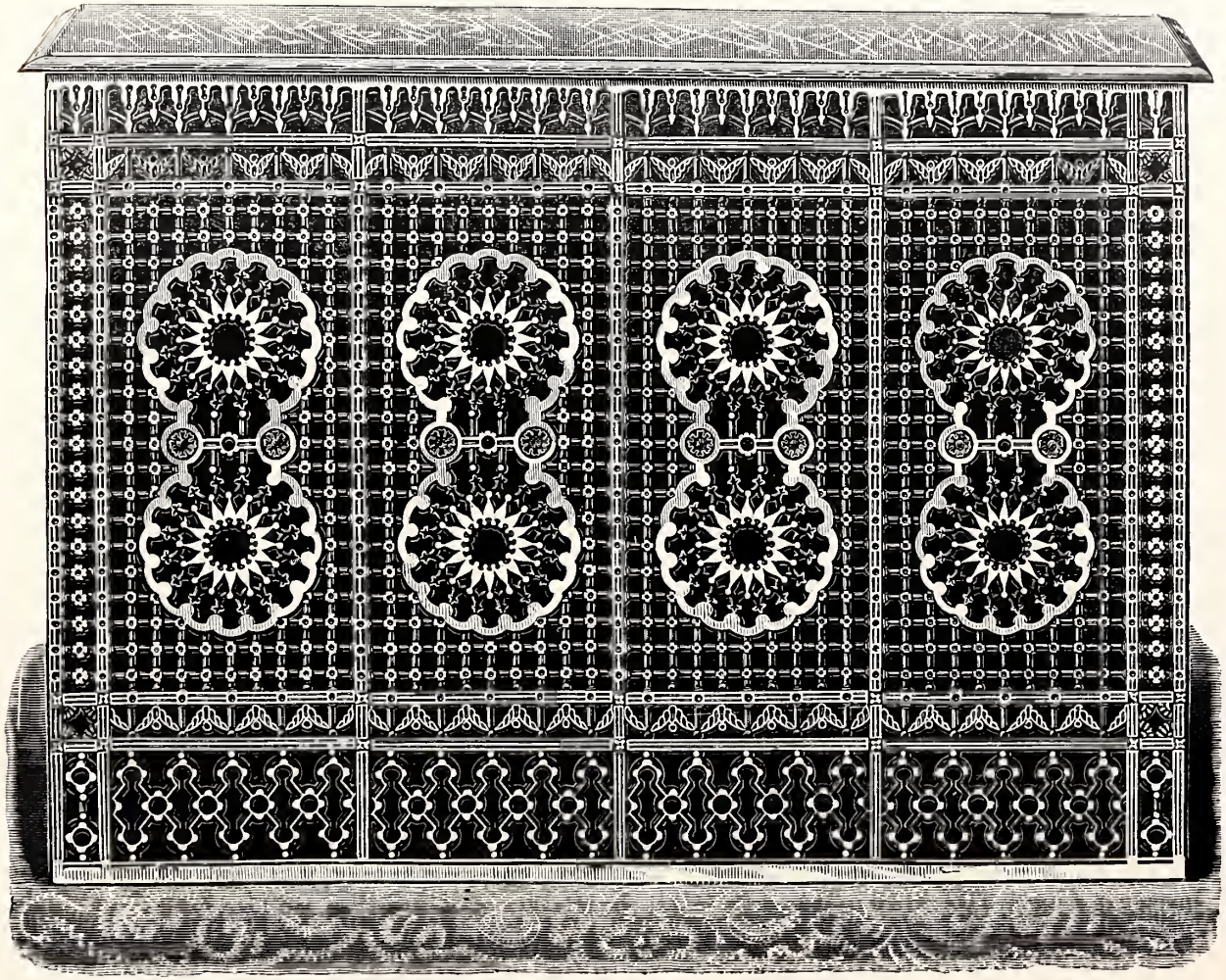
Figure 9 shows a form of box coil as used in indirect radiation, or as often used in residences, churches and stores for direct radiation, in which case they are generally covered with ornamental covers or screens, as shown in Figures 10 and 11.

FIGURE 10. PATTERN NO. 1.



This cut shows box-coil screen with marble top, as made by the Tuttle & Bailey Mfg. Co., 83 Beekman Street, New York, and 64 Union Street, Boston.

FIGURE 11. PATTERN NO. 6.



This figure shows another form of box-coil screen made by the Tuttle & Bailey Mfg. Co., through whose courtesy the cuts are furnished.

CAST IRON RADIATORS.

Among manufacturers of cast iron hot water radiators The A. A. Griffing Iron Co., of Jersey City, N. J., occupies a leading position. Through their courtesy we show cuts of several radiators of their make.

FIGURE 12.

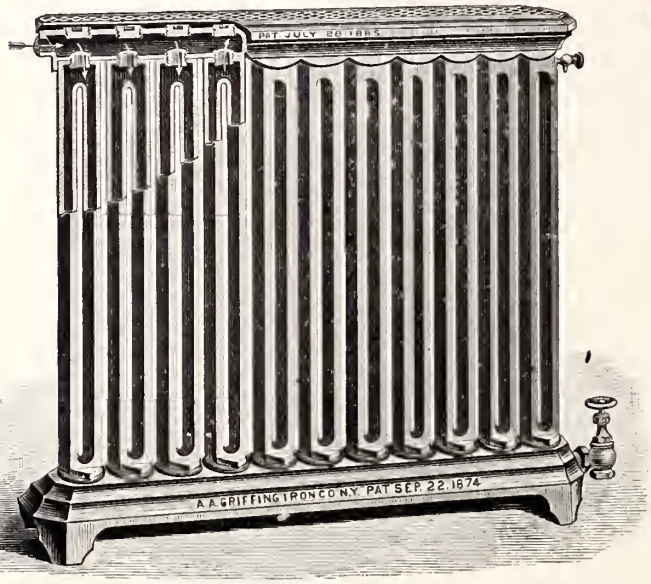


FIGURE 13.

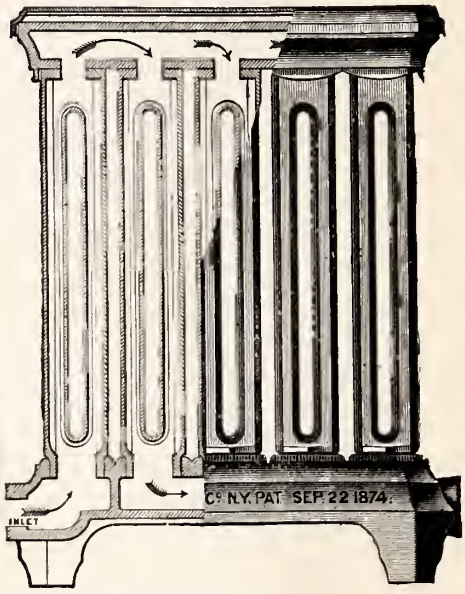


Figure 12—The "Bundy" one row radiator, with flow-pipe connection at top.
Figure 13—The "Bundy" radiator, with flow-pipe connection at bottom.

FIGURE 14.

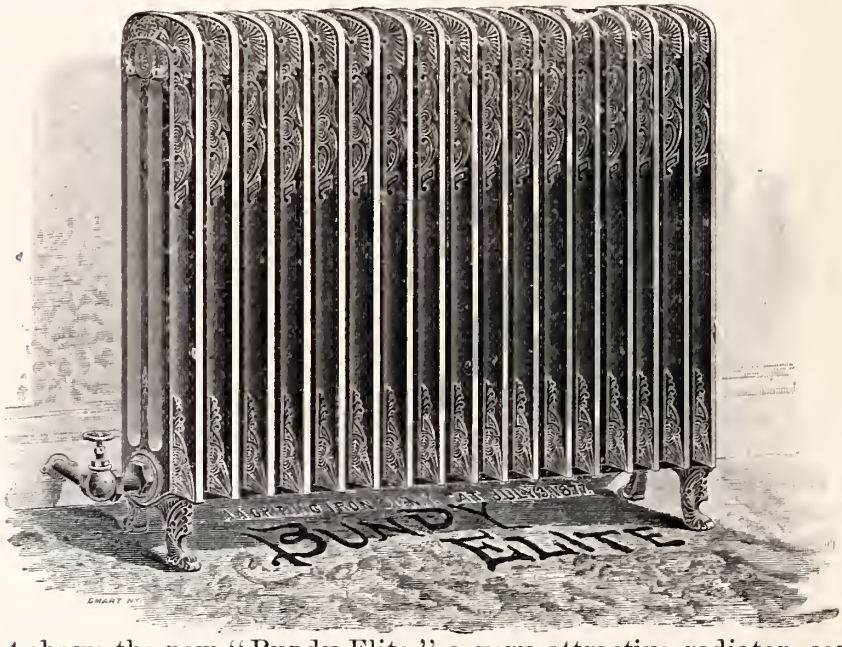


Figure 14 shows the new "Bundy Elite," a very attractive radiator, constructed on correct principles.

The H. B. Smith Co., of Westfield, Mass., have kindly furnished us cuts of their popular "Union" radiators, of which we show top, end and side view, in Figures 16, 17 and 18 respectively.

FIGURE 16.

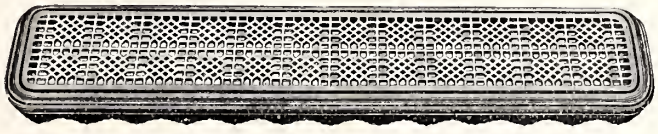


FIGURE 17.

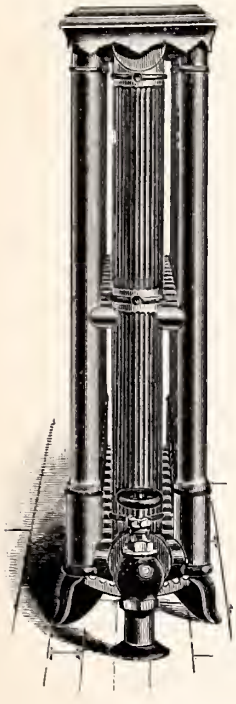
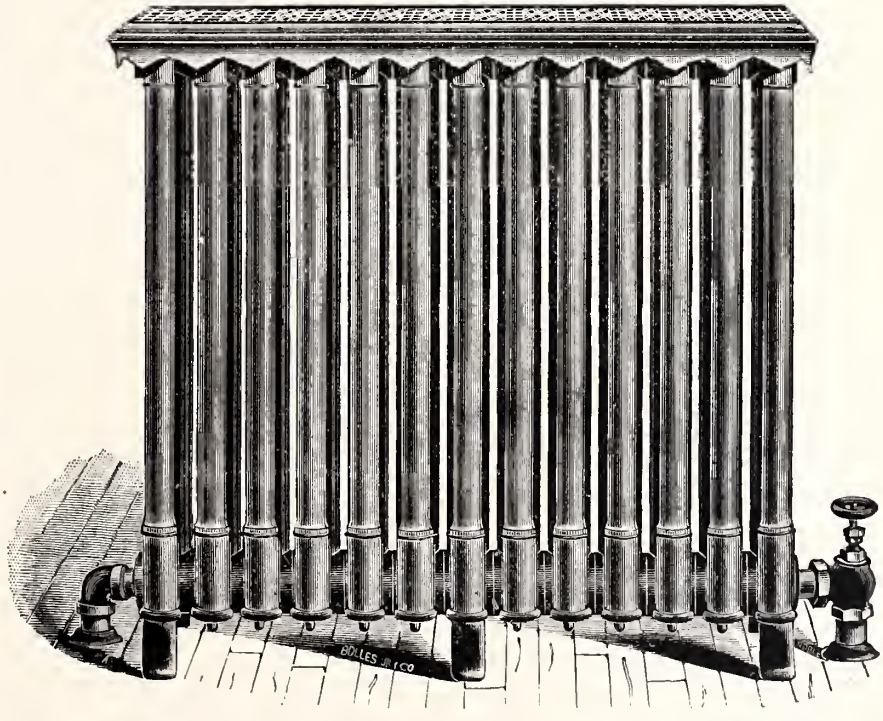


FIGURE 18.



The "Eclipse" radiators, manufactured by The Eclipse Manufacturing Co., Chicago, have many excellent points. Their neat appearance is shown in Figure 19. Figures 20 and 21 show the top and side views respectively of the Eclipse Hot Closet Radiator.

FIGURE 19.

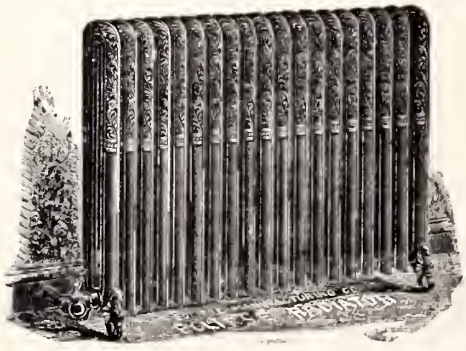


FIGURE 20.

FIGURE 21.

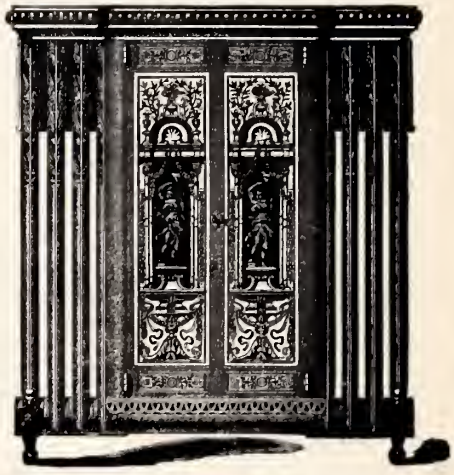
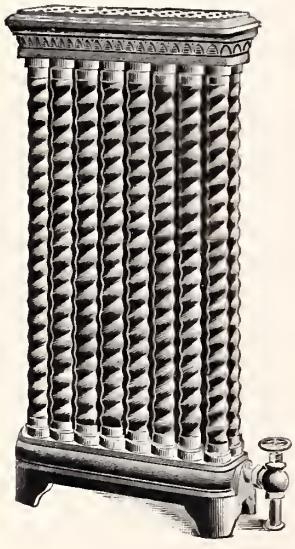


FIGURE 22.



The radiator shown in Figure 22 is a sample of corrugated brass radiators made by the Wainwright Manufacturing Co., of Boston. It is very neat and attractive in appearance.

M. MAHONY,
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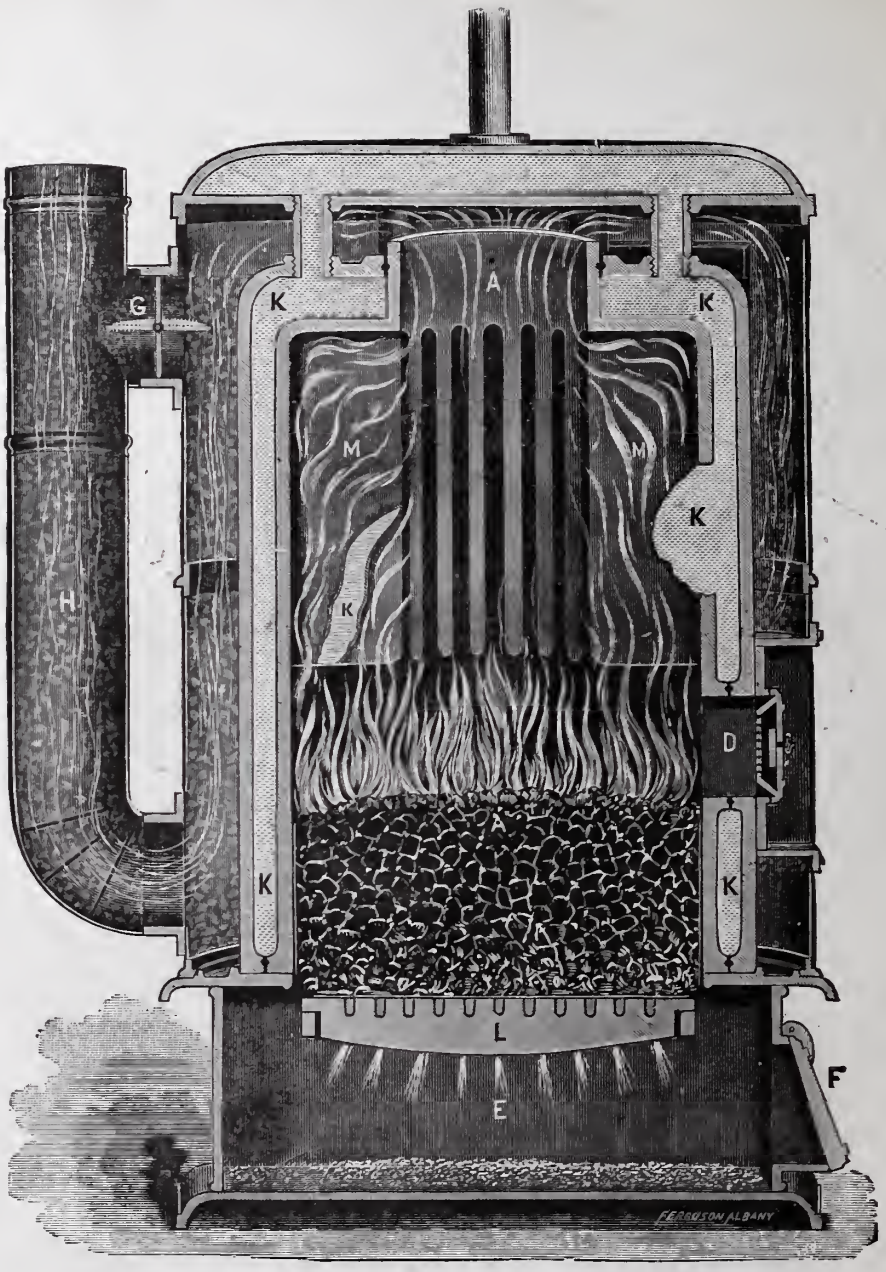
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